

## **1. Acknowledgements**

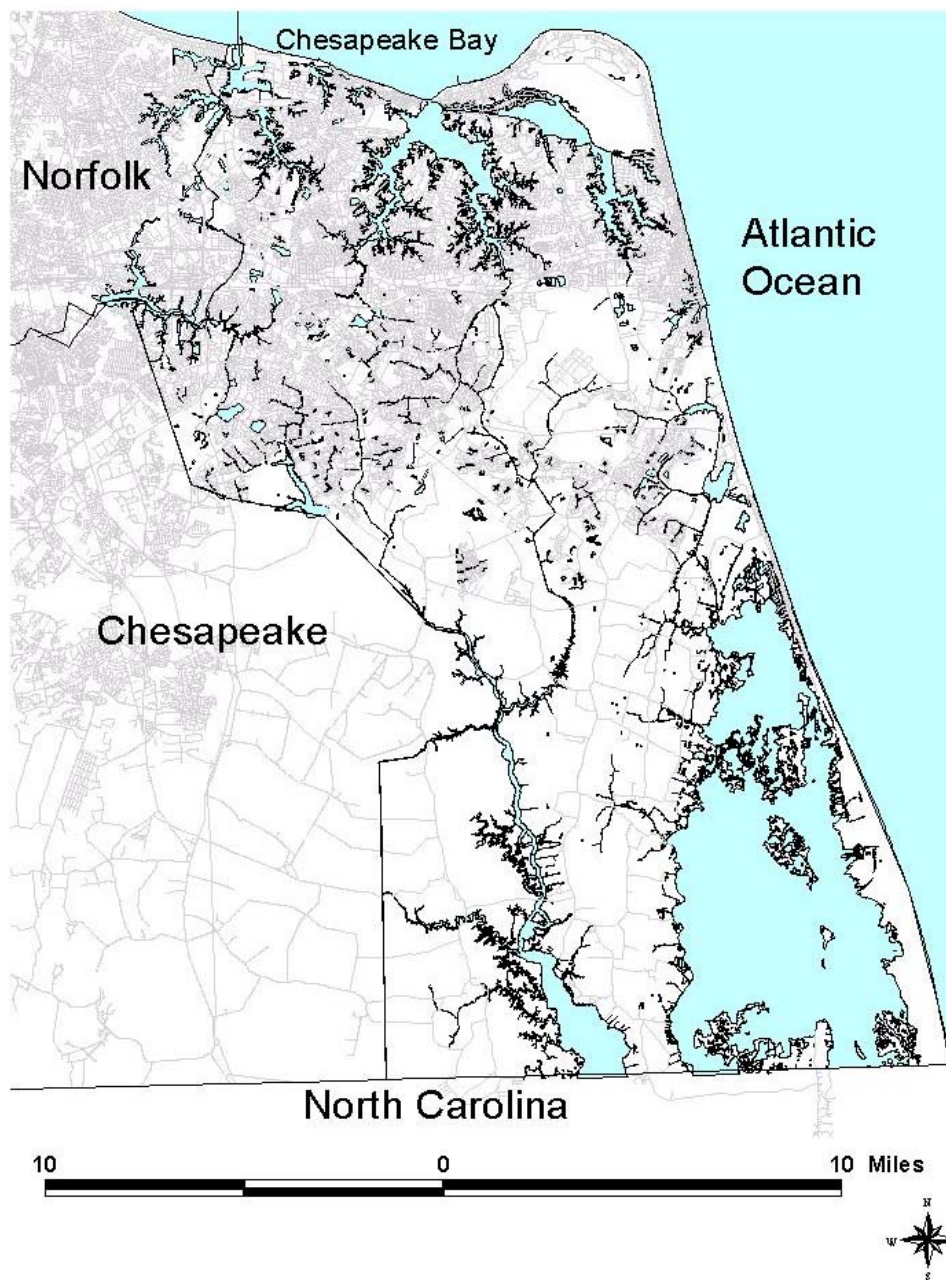
We would like to thank all who contributed to the Lynnhaven River Watershed Management Plan, with particular thanks to Steve McLaughlin and Bill Johnston from the City of Virginia Beach Department of Public Works. Additional thanks goes to those who answered many questions for us via phone, e-mail, and in person, such as Christy Everett from the Chesapeake Bay Foundation, Bob Murphy from the Alliance for the Chesapeake Bay, and Brian Hostetter and Wilkie Dinn from Oceana Naval Air Station.

Funding for development of the Lynnhaven River Watershed Management Plan came from a grant from the Environmental Protection Agency's Small Watersheds Grant program, administered by the National Fish and Wildlife Foundation.

## **2. Executive Summary**

### **2.1 Introduction**

The City of Virginia Beach is a highly urbanized coastal community located within the Hampton Roads region of southeastern Virginia. The City is bordered by the Cities of Norfolk and Chesapeake to the west, North Carolina to the south, the Atlantic Ocean to the east and the Chesapeake Bay to the north. (Figure 1).



**Figure 1**

Three major watersheds make up the City; the northern third of the City is in the Chesapeake Bay Watershed, the southern two-thirds of the City is in the Southern Watersheds, which drain to North Carolina, and a small strip of land along the oceanfront which, along with the Owls Creek Watershed, drains directly to the Atlantic Ocean. The Lynnhaven River Watershed is a subwatershed of the Chesapeake Bay Watershed, locating entirely within the

Draft

Draft

City and makes up the northeastern two-thirds of the Chesapeake Bay Watershed in the City.  
(Figures 2 and 3)

Draft

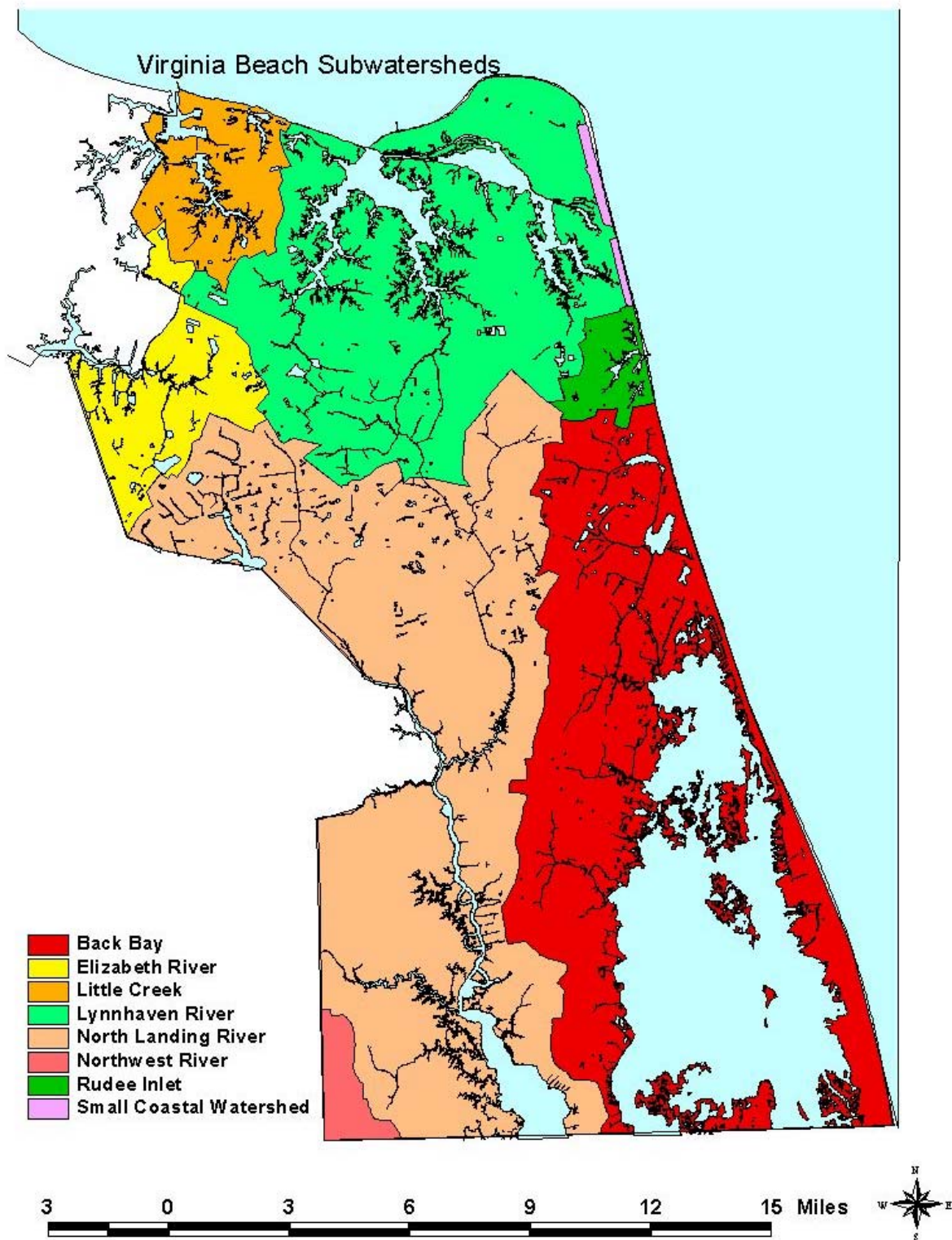


Figure 2

Draft



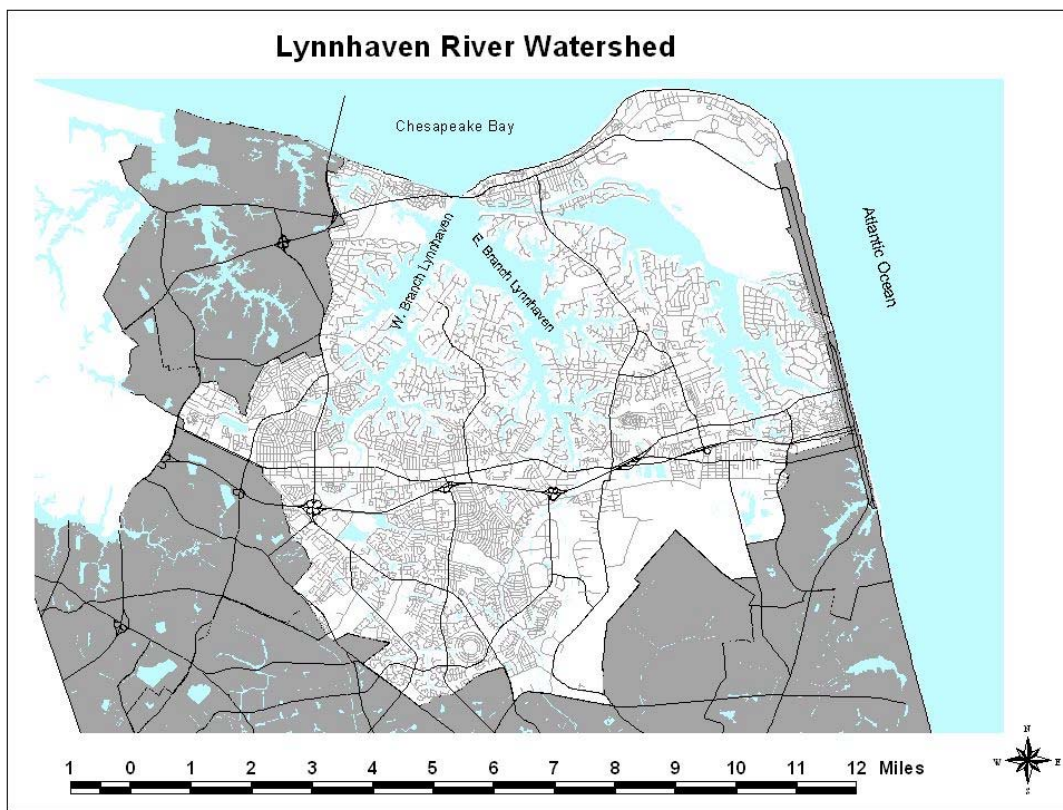


Figure 3

### 2.1.1 Watershed Planning Process

As it began the development of a Lynnhaven River Watershed Management Plan, the City of Virginia Beach researched watershed planning processes utilized in other efforts by localities within the Hampton Roads region, other localities in the Commonwealth of Virginia, localities in other states, and the Federal government. While the particulars varied, all of these efforts shared four basic steps that have been summarized to some degree by the EPA's Office of Water; build a watershed management group, establish concerns, information and objectives, develop a game plan with action alternatives and selection and tracking processes and conclude by implementing and evaluating.

The Lynnhaven River Watershed Management planning process was already well underway as the City began its focused efforts to develop a plan. A community watershed organization has since become established that is known as Lynnhaven River 2007. The City organization simultaneously created a Lynnhaven River Watershed Task Force. Both of these groups share ideas, membership, information and resources, thereby forming a solid foundation for the development of a plan. The next steps taken by the City have focused upon; establishing a background by defining existing programs and conditions, recognizing gaps in the existing

Draft

system, developing a plan for filling in those gaps and culminating the efforts by implementing actions and evaluating effectiveness.

Our approach to designing a watershed management plan for the Lynnhaven River Watershed was to identify all existing programs, look for gaps that the programs do not cover. Once this was accomplished, it became possible to define a vision, establish goals, set objectives, and develop actions. Taken together, these policy recommendations became the strategy to fill the identified gaps. Additionally, it was recognized early in the effort that it was important to design a plan that would be realistic about the nature of an urban watershed and identify ways to bring back the watershed's ability to sustain a healthy plant and animal habitat without disregarding the human component in the equation. This is a big challenge. The Lynnhaven Watershed has a population of about a quarter of a million and is very close to being "built out." Impervious cover is increasing, natural areas are decreasing, and native plants and animals are under stress. However, with the dedication of all interested parties, it is envisioned that the plan can provide the foundation to restore the health of the Lynnhaven River Watershed in this urban environment.

### **2.1.1 Community-Based Planning and Implementation Approach**

Early in the data collection phase, it was recognized that a community-based planning approach to watershed management would be utilized for the planning process because plans will be site-specific and tailored to meet the needs of this area, as opposed to a cookie-cutter approach that may not meet Virginia Beach's specific needs. Representatives from City, State, Federal agencies, as well as non-profit, community, and business groups have been involved in the formation of the plan. This same community-based approach is seen as imperative to the implementation of the Plan. Such an approach will help to ensure that implementation efforts are effective, collaborative, comprehensive, and sustainable. In short, our planning and implementation approach is intended to mimic natural processes, which they are intended to protect and restore. Sustainability for preservation of natural resources is another key component of a community-based planning approach.

### **2.1.2 Policy Goals**

The major goals of this plan are:

1. Remove waterways from the state's "impaired" list
2. Improve water quality in the watershed to the point that oysters and SAV flourish again
3. Educate citizens about what they can do to improve the watershed
4. Improve stormwater management in the Lynnhaven and reduce non-point source runoff through a variety of measures.

### **2.1.3 Integration of Planning Efforts**

With the integration of planning efforts, there is less duplication and a greater likelihood of reaching the goals of the Lynnhaven River Watershed Management Plan.

## **2.2 Rationale for Watershed Management**

The purpose of this plan is to coordinate the efforts of both City and outside agencies to preserve existing high quality areas of the watershed and improve sub-quality areas.

The rationale for watershed management is that if all of the land and water in the watershed is properly managed and protected, the waterways will only benefit, and in turn, the natural and manmade environment will be in harmony and sustainable, even with the dynamics inherent in a living system.

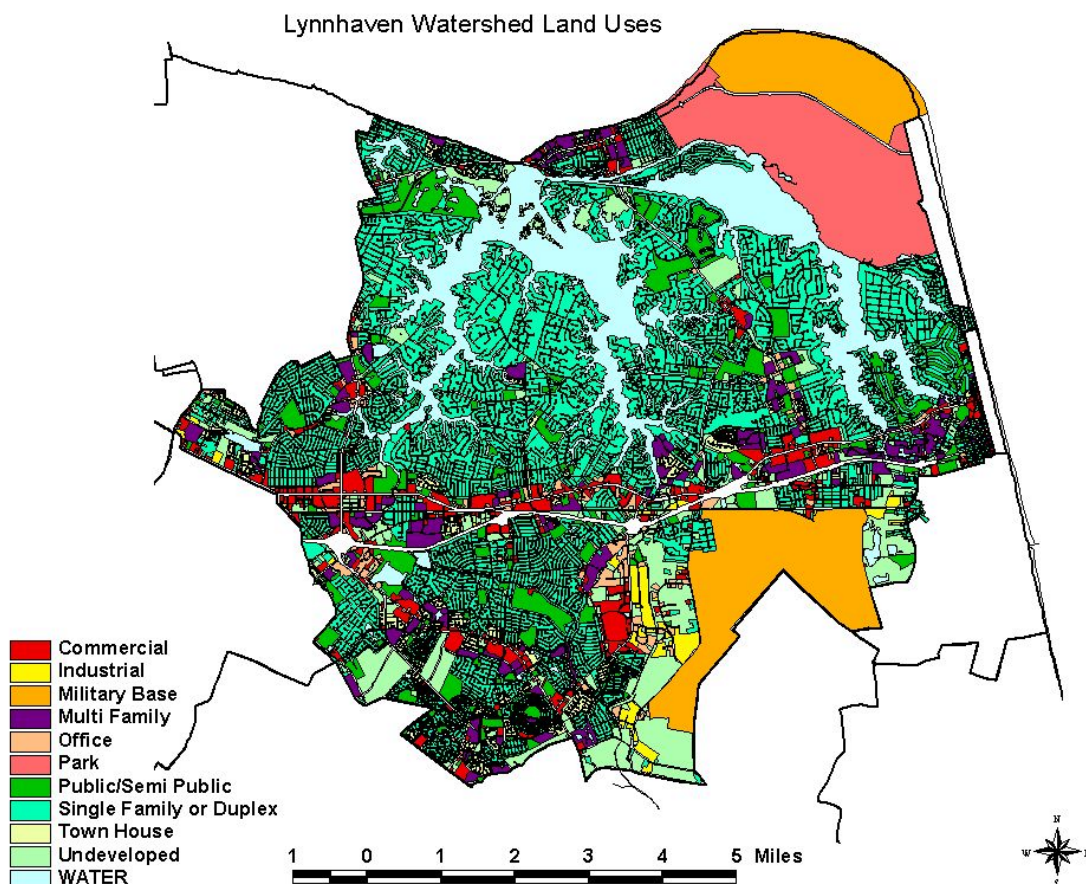
A watershed management plan is intended to collaborate community efforts at all levels to work toward the vision of an environmentally and economically healthy watershed that benefits all who have a stake in it. Protecting and restoring a watershed has a myriad of benefits to a community's natural and manmade environment. A protection strategy improves the quality and quantity of water for the survival of fish and wildlife, stabilizes natural habitat and hydrological conditions and meets local, state, and federal environmental regulatory requirements.

## **2.3 Existing Conditions and Resources Sensitivity**

### **2.3.1 Land Uses**

Land use in the Lynnhaven Watershed is primarily single-family. The largest land types after those are open water and the street network.

Land Use Type	Acres	% of Watershed
Single Family/Duplex	14750.0	33.8
Water	5791.2	13.3
Street Network	5162.1	11.8
Military Base	3939.8	9.0
Undeveloped	3540.7	8.1
Park	2875.5	6.6
Public/Semi-Public	2707.5	6.2
Commercial	1724.5	4.0
Multi-Family	1536.8	3.5
Town House	772.6	1.8
Industrial	439.0	1.0
Office	64.6	0.2



### 2.3.2 Designated Uses for Waterways

At this time, no areas of the Lynnhaven Watershed have been designated for any specific uses. This in effect means that the waterways are available for water contact recreation, fishing and swimming. However, shellfishing is restricted for direct marketing purposes to areas within Broad Bay and is subject to regular reevaluation based on water quality sampling of bacterial contamination. In all other waterways shellfishing is subject to state depuration requirements.

## 3. Introduction

### 3.1 History of the Lynnhaven Watershed

The first European settlers arrived in Virginia Beach in 1607 at what is now Cape Henry. History tells that the settlers stopped to thank God on the spot for their safe arrival and to ask for His blessings on the new Virginia colony. The event is commemorated by a cross at Cape Henry and in the name of the state park located there, First Landing State Park. The seal of the City of Virginia Beach also depicts the First Landing cross. The colonists soon moved up the James River and established the settlement of Jamestown.



Draft

The name Lynnhaven comes from Adam Thoroughgood, one of the first permanent residents in the area. Thoroughgood's home in England was called King's Lynn, and the landscape of the new world reminded him of that place, so he named the river Lynnhaven.

Thoroughgood's house remains standing in Virginia Beach, a national register historical landmark and tourist attraction.

1600's:

In the late 1600's, pirates terrorized and raided ships sailing through the Chesapeake Bay. Merchant ships loaded with goods from Virginia began to meet on Lynnhaven Bay to sail into the Chesapeake Bay under the protection of an armed guard ship. Unfortunately, the pirates had the superior firepower and the guard ships were often soundly defeated. The pirates began to get bolder, sailing into the Lynnhaven Bay to plunder ships anchored there. One Frenchman by the name of Louis Guittar and his crew on the ship the *La Paix* looted 19 ships before being defeated by Englishman William Passenger and his crew on the *Shorham*. Guittar and 63 of his crewman were eventually hanged for their crimes in England. The famous pirate Blackbeard was also known to frequent the area.

1700's:

Witchcraft was another worry for the deeply religious settlers of Princess Anne County. The most famous witch was Grace Sherwood, a woman living in the Pungo area in the early 1700's. After a series of what the inhabitants of the area perceived to be odd behaviors, Grace was tried for witchcraft by a common means of determining whether a woman was a witch by dunking her in the water or "ducking." Grace was ducked in what is now known as Witchduck Bay on the Lynnhaven River. Since water was thought to be the purest substance, it would reject anything evil such as a witch. When Grace was able to free herself from the ropes she was tied with and swim to safety, she was found guilty and imprisoned. Eventually, she was set free and lived out her remaining years in Pungo.

During the Revolutionary War, a French fleet was anchored in Lynnhaven Bay under the command of French Admiral de Grasse. The British Navy attempted to corner the French at the narrow Lynnhaven Inlet, hoping for an easy defeat, but the French fought back fiercely and defeated the British instead. This victory gave the American and French troops control of the entrance to the Chesapeake Bay, cutting off supplies to British troops at Yorktown. 5 weeks later, General Cornwallis surrendered and the war was over.

As trade between the New and Old Worlds became more abundant, ship traffic became heavy in the Chesapeake Bay. After many years of negotiations (so even then, government could work very slowly sometimes), the famous Cape Henry Lighthouse was built in the late 1700's to guide ships through the Bay and into the Atlantic Ocean. This lighthouse was the first public works project authorized by the Federal government.

Draft

Draft

In the 1800's more people began to make their homes in Virginia Beach, or Princess Anne County as it was known then, with “Virginia Beach” actually just a small town right at the oceanfront. Farmers tilled the fertile land and fisherman harvested the abundant Lynnhaven Oyster growing in the Lynnhaven River and forming reefs 30 feet high in some places. By the late 1800's, Virginia Beach was fast becoming a hot spot for middle and upper class vacationers looking for some sun and fun.

The 1900's saw Virginia Beach continuing to grow as a popular vacation spot, and Princess Anne County, while still a mostly rural area, was growing, too. In 1963, Princess Anne County and the town of Virginia Beach were incorporated into what it is today, the City of Virginia Beach.

### **3.2 Watershed Management Planning Process**

#### **3.2.1 Participation**

##### **3.2.1.1 Coordinating Committee**

##### **3.2.1.2 City Task Force**

##### **3.2.1.3 Corps Study Team**

##### **3.2.1.4 Technical Advisory Committee**

#### **3.2.2 Watershed Management Planning Steps**

### **3.3 Policy Goals**

### **3.4 Document Overview**

### **3.5 Integration of Planning Efforts**

## **4.0 Rationale for Watershed Management**

The rationale for watershed management is to plan and work toward an environmentally and economically healthy watershed that benefits all who have a stake in it. Protecting and restoring a watershed has a myriad of benefits to a community’s natural environment. A protection strategy improves the quality and quantity of water for the survival of fish and wildlife and stabilizes natural habitat and hydrological conditions and meets local, state, federal and environmental regulating requirements. Most importantly a watershed management plan states s commitment to be a healthy livable community.

### **4.1 Federal, State and Bay motivation**

The Lynnhaven Local Watershed Management Plan also provides a policy framework for the City of Virginia Beach to make consistent decisions about the activities, practices, and procedures that are appropriate within the watershed to protect land and water resources. To aid the City of Virginia Beach in its’ decision-making, the Lynnhaven Watershed Management Plan provides a vision and a comprehensive set of goals, policies, and management actions that address all Watershed activities and reflect the unique qualities of the Watershed. Listed below are goals for the Lynnhaven Watershed:

Draft

Draft

1. Maintain and restore the natural hydrology of streams;
2. Maintain and restore the habitat necessary to sustain water-related ecosystems;
3. Maintain and restore headwaters, riparian corridors, and associated buffers for the protection of water quality and wildlife habitat, flood control, public safety, and stream channel stability;
4. Maintain forest resources that are critical to water resource protection and redevelop buffers along waterways;
5. Use better site design when dealing with new development;
6. Accommodate growth while protecting water resources;
7. Minimize soil erosion caused by human activity;
8. Preserve, protect and restore water-related biological diversity through the protection of rare, threatened, and endangered species;
9. Preserve open space for current and future protection of the water resources, biological diversity, and recreation; and
10. Build watershed stewardship in the community through environmental programs and projects.

There are many local, regional, state and federal requirements that motivate the need for a Lynnhaven Watershed Plan as well as the desire to protect our natural resources and community. Federal watershed management initiatives come into play with the Clean Water Act, Clean Water Action Plan and Coastal Nonpoint Source Pollution Control Program. At the State level, initiatives include the Water Quality Improvement Act that requires state agencies to develop and promote cooperative watershed programs. There is the development of Watershed Roundtables for each river basin in order to provide watershed-based forums for stakeholders to participate in defining critical watershed needs. Several state agencies have created the Tributary Strategy Development and Implementation. The Lynnhaven Watershed is located in the Lower James River where strategies have been prepared for water quality improvements specifically targeting increased clarity, dissolved oxygen levels and fecal coliform and nutrient levels. These improvements provide a basis for the reestablishment of habitat for underwater grasses, finfish, shellfish and other living resources. The state has also defined a Total Maximum Daily Load (TMDL) Priority List in response to the Clean Water Act and EPAs' Water Quality Planning and Management regulations. The Chesapeake 2000 Agreement expresses the need to improve water quality and sustain living resources of the Chesapeake Bay and its tidal tributaries, even going as far as setting a goal to improve water quality so that the bay will be removed from EPA's list of impaired waters by 2010. The City of Virginia Beach is required by law to manage and protect its water resources and have received a grant from EPA through the Chesapeake 2000 to make this happen in the form of a Watershed Management Plan. This plan will also be important to complement the Natural Resources and Environmental Quality element of the City's Comprehensive Plan. The City of Virginia Beach's Comprehensive Plan formally sets forth the policies for the City's future and serves as a guide for many public decisions including land use changes, preparation of capital improvements programs as well as zoning and related growth management measures.

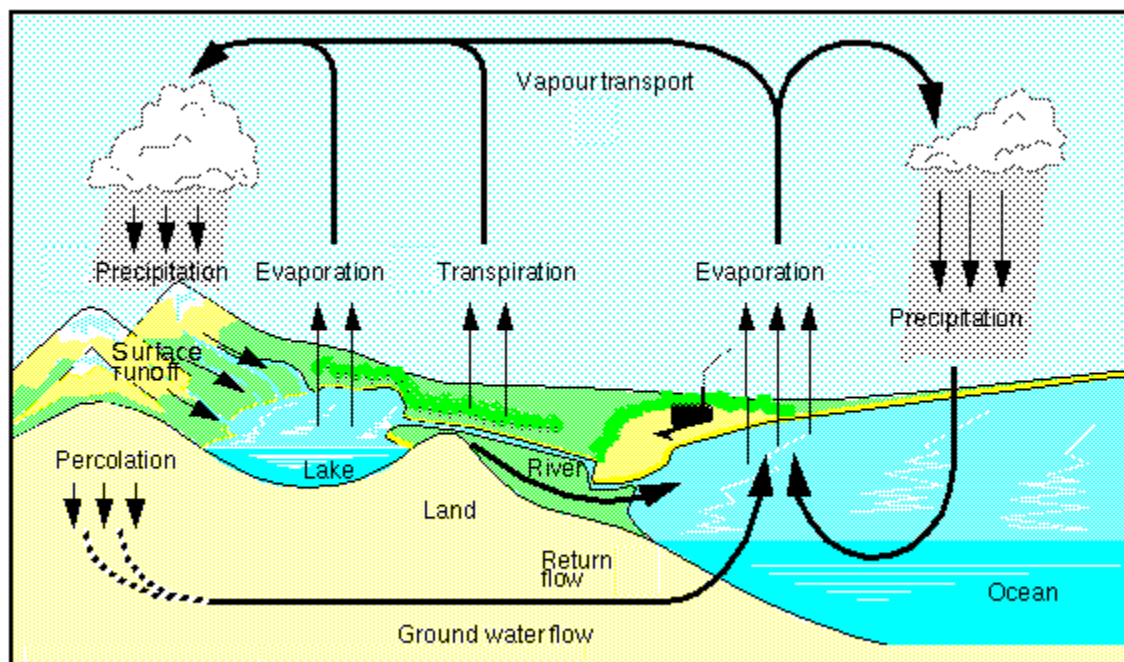
Draft

## **4.2 Need for Protection of Water Resources**

Growth in the Lynnhaven Watershed has been significant over the past 40 to 50 years, not only increasing the demand for water from available surface waters, but increasing the amount of wastewater and stormwater pollution as well. The City now faces new challenges in dealing with surface water pollution from stormwater runoff, increasing amounts of impervious surfaces from both redevelopment and new development. It is possible that in the near future many rivers and lakes will not meet their designated uses anymore, which will have an effect on the local economy and the lifestyles of many local residents, if we don't do something about it now.

The City is home to many waterways and many miles of shoreline. Extensive reaches of shoreline in the Lynnhaven have been developed with large homes and beautifully manicured lawns that extend to the water's edge. Riparian buffers that once absorbed nutrient and sediment runoff have been removed to provide a better view. Fertilizer from lawns run straight into the waterways, causing excess algae blooms, which, in turn, leads to eutrophication, water pollution caused by excess plant nutrients. Algae blooms not only block light from reaching underwater plants, but lowers oxygen levels in the water, leading to fish kills and "dead zones" in the water column.

The EPA's TMDL regulations require the State to determine the maximum pollutant loads that can be delivered to impaired water bodies and still maintain water quality standards. Localities are then required to develop a specific management plan keyed to each pollutant for water bodies that do not currently meet standards.



Courtesy Erich Roeckner, Max Planck Institute for Meteorology

Figure 4

#### 4.2.1 Need for Protection of Water Resources for Humans

Everyone has a watershed address, sometimes several for where they live, where they work, and where they play. Everyone relies on water and other natural resources to exist and it affects every aspect of our lives. Healthy watersheds are vital for a healthy environment and economy. Watersheds provide water for drinking, irrigation and industry. Many people also enjoy lakes and streams for their beauty and for boating, fishing and swimming. Managing the water and other natural resources is an effective and efficient way to sustain the local economy and environmental health. Scientists and leaders now recognize the best way to protect vital natural resources is to understand and manage them on a watershed-wide basis. Everything, including impacts upon land and in water, affects a watershed. A Watershed Management Plan will give officials and the community guidelines to establish and sustain a healthier watershed.

A Watershed Management Plan helps the community's human capital as well. It outlines educational opportunities for citizens to understand the interaction of natural resource management with existing and future development. It describes how citizens have an active voice in protecting and restoring natural resources that are important to the community as well as providing opportunities to increase cooperation with neighboring communities. Having residents involved in the creation of a plan gives them a sense of stewardship and pride toward their community and watershed. This will only increase their desire to abide by the Plan as well as their desire to be advocates and educators of others.



Draft

If a community chooses not to plan for the future in a watershed it may reciprocate in a way other than good water quality. Impacts of uncontrolled runoff could cause property and structural damage associated with flooding, increased cost of water supply treatment, declining value of waterfront property, loss of recreational opportunities, increased litigation and an overall reduction in the quality of life. Taking time in the present day to address a continual issue will save damage, money and time in the future.

#### **4.2.2 Need for Protection of Water Resources for Wildlife**

Humans are not the only ones who benefit from a healthy ecosystem, wildlife benefits as well. A healthy watershed provides a clean habitat for fish and other aquatic life, a food source for animals and, and living quarters for migratory birds. A Lynnhaven River Watershed Management Plan will help to maintain biological and habitat diversity and promote habitat connectivity by protecting wildlife and riparian corridors between subwatersheds. Watersheds as planning units make inherent sense for wildlife species closely linked to water availability and dynamics.

The Lynnhaven Watershed is home to a significant commercial and recreational fishing and shellfishing industry. It has been in decline over the past few decades due to overharvesting and poor water quality. This plan will work to ensure that guidelines are put in place to restore water quality to its former level and thereby bring back the fisheries to their optimal sustainable yields.

#### **4.3 Influence of Land Use Changes on a Watershed**

Over the last four to five decades the City of Virginia Beach has seen rapid development and vast population growth. While beneficial for economic growth, this also puts heavy strains on our watersheds. Increasing population increases water usage as well as the amount of wastewater and stormwater pollutants that flow into area waterways. Development also disrupts the natural hydrology of the land. Clearing the land removes the vegetation that intercepts runoff and causes it to flow straight to the waterways, taking sediment and pollution with it. Grading the land flattens depressions and rises that act as natural water filters that slow and provide temporary storage for rainfall. Development also removes the topsoil and organic material revealing the hard compacted subsoil, reducing the amount of infiltration that can occur and increasing the amount of runoff. Wetlands are often destroyed in the process of development, ridding the land of natural water filters and no longer creating a barrier between runoff and open water. Older developments in the City that were put to record before current floodplain regulations went into affect can result in low areas being filled for development, diverting floodwaters onto other, lower properties. The changing and development of our land directly affects our watersheds and water quality.

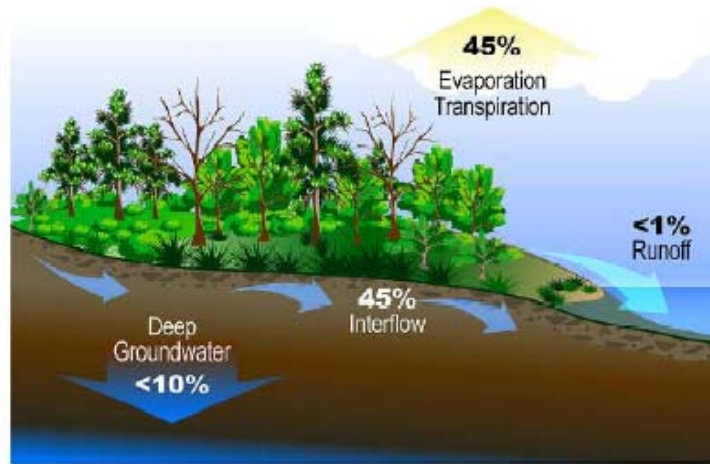
##### **4.3.1 Where Rainfall Goes Before and After Development**

Draft

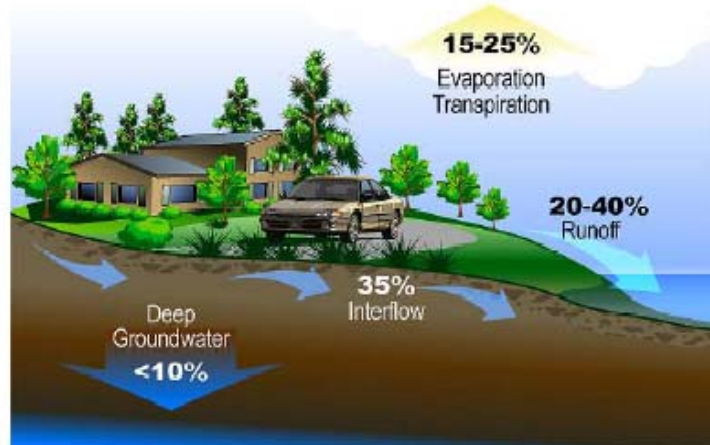
Draft

Before development, land is full of forests, meadows, wetlands, and many other land cover types that absorb rain and runoff. In a forest, rain soaks into the ground and is either taken up by tree roots or continues to move down through the soil and into the groundwater and shallow aquifers. Once land is developed with buildings, roadways, and other infrastructure, impervious cover is created. This is defined as any land cover which hardens the landscape, both natural and human-made, that does not allow rainfall to soak or infiltrate into the soil. Impervious cover comes in the form of roads, parking lots, rooftops, sidewalks and driveways. When rain falls on impervious cover, it cannot infiltrate the ground and instead becomes stormwater runoff. Not only does it become runoff, but it also functions as a transporter of pollutants and nutrients that it collects as it runs over the impenetrable surfaces. Impervious cover produces 16 times more stormwater runoff than a forest. The quality of streams is directly linked to land cover. If it were to rain 2 inches on a parking lot, 1.9 inches would become runoff. In a forest, only .12 inches would become stormwater runoff with the remainder soaking into the ground. (Figure 5)

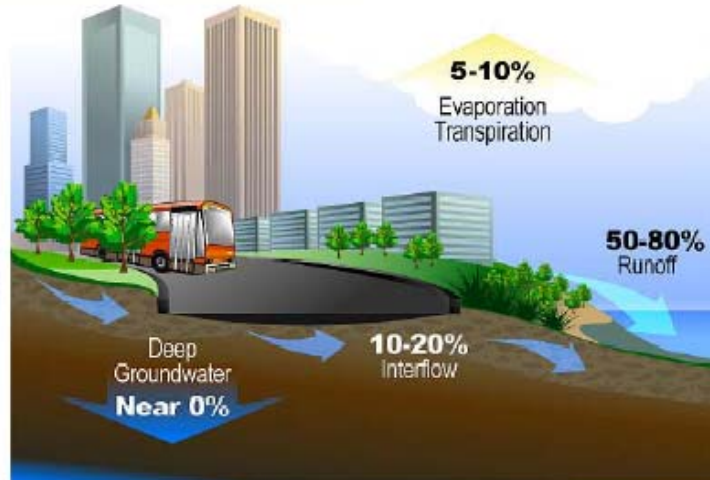
### Natural Conditions



### Suburban/Residential



### Urban Development



{from: <http://www.northgeorgiawater.com/pdfs/CH2M-SW/11-03FINALWMPLAN/SEC02A.PDF> page 2-4 }

### **4.3.2 Linkages Between Hydrology and Watershed Health**

Altering the hydrology in a watershed has a drastic impact on watershed health. Impacts can be seen in the form of flooding, erosion, habitat degradation or declining water quality. Altering the natural landscape changes the volume and timing of surface runoff. Such alterations also have social and economic impacts on a watershed. Flooding occurs, causing property and structural damage. Drinking water becomes contaminated and an increased cost is required to treat it. There is a loss of recreational opportunities and a decline in the value of waterfront property. Loss of fisheries harms people and businesses that depend on them as a livelihood. The City of Virginia Beach desires to address these impacts with the Lynnhaven Watershed Management Plan and wants to meet state and federal water quality standards as well as making it safer and more desirable community for its citizens.

### **4.3.3 Impervious Cover; LID Where Feasible for Redevelopment or New Development**

A large amount of impervious cover is a given in any community of size, however there are ways to accommodate the need for buildings, roads, sidewalks, and parking lots that are a part of large communities while minimizing the impact on the environment, particularly the watershed. Low Impact Development (LID) is an approach to land development that uses various land planning and design practices and technologies to simultaneously conserve and protect natural resource systems and reduce infrastructure costs. LID still allows land to be developed, but in a cost-effective manner that helps mitigate potential environmental impacts.

When considering new development or redevelopment in the Lynnhaven Watershed, there are actions that can be taken to provide for LID. Impervious cover can be minimized and permeable surfaces can be used for parking areas, roadways and sidewalks can be minimized in width, cul-de-sacs can be donuted to leave permeable surface in the center. Other practices that LID uses include bioretention, infiltration practices, vegetative filters or buffers, and disconnecting impervious areas. One of the main goals when designing an LID site is to replicate the pre-development runoff rate, where many of these practices aid in this process. Over all an LID site does require a more detailed site design and greater construction oversight, but it reaps its benefits in reducing infrastructure and maintenance cost. Additionally, it proves to provide a greater pollutant removal, increase groundwater recharge and reduce downstream erosion. When dealing with land that has already been developed by conventional methods, some LID practices can be added and impervious cover reduced. Disconnectivity deals with disconnecting as much impervious cover as possible and reducing direct connections to storm drains and causing it to impact receiving streams. If there are areas to add infiltration practices and bioretention this would aid in recreating the pre-development runoff rate.

#### **4.3.4 Relationship Between Total and Effective Impervious Area**

The US Environmental Protection Agency reports impervious cover in a watershed in two basic ways (EPA, 2002):

-Total Impervious Area (TIA) – Includes all impervious cover in a watershed, including rooftops and transport systems. TIA typically is expressed as a percentage of the total watershed area. It can be calculated by direct measurement or by estimating the percentage based on land use, road density, population density, or other indicators.

-Effective Impervious Area (EIA) – The portion of total impervious cover that is “directly” connected to the storm drain network (CH2M HILL, 2003). These surfaces usually include streets (and immediately adjacent paved areas), parking lots, and rooftops that are hydraulically connected to the drainage network, such as downspouts, that discharge directly to gutters or driveways). EIA also is usually expressed as a percentage of the total watershed area. It is the preferred statistic for use when estimating runoff volumes because it is the portion of the impervious cover that generates direct runoff and that directly impacts receiving streams.

EIA tends to be a smaller percentage compared to TIA in low-density residential areas. However in areas of industrial and commercial development the EIA often equals the TIA because there is no pervious area to break up the direct connections. This is where low impact development can help to minimize the amount of runoff by providing areas that can infiltrate rainfall. The EPA has indicated that “healthy” watershed conditions, or pristine conditions can be sustained if EIA is maintained at or below 10 percent (CH2M HILL, 2003).

If EIA exceeds this, changes in the hydrology will lead to increased stormwater runoff and erosion degrading the waterways. The more destruction occurring to the aquatic habitat is directly related to the percentage of EIA. With this information in mind the Lynnhaven River Watershed recommends using structural and nonstructural control measures to keep the EIA at 10 percent or less. This is a difficult task when dealing with such an urban locality and that is why it is also recommended that any re-development that occurs consider using Low Impact Design that will break up impervious cover leading to more disconnectivity and a reduced impact on the Watershed.

#### **4.3.5 Addressing Stormwater Runoff and Maintaining Watershed Health**

As development in an area increases, the amount of stormwater runoff increases, too, due to larger amounts of impervious cover. Stormwater quality is affected as well. Changes in stream flow will occur resulting in increased runoff volumes, increased peak discharges, greater runoff velocities and lower dry weather stream flows. The frequency of flooding increases due to high volumes of runoff in a short period of time and flooding reaches higher levels than pre-development. Additionally, impervious cover prevents water from replenishing groundwater supplies. Changes in stream geometry will be seen through stream widening and down-cutting, loss of riparian tree cover and increased sedimentation in the



Draft

channel; these effects will also result in degradation of habitat structure, increased temperatures and reduced flora and fauna diversity. Not only do impervious cover and stormwater runoff affect stream structure, but also the quality of the water inside those streams is affected. Pollutants are washed away with the stormwater runoff and directed through the storm drain directly into the stream. These pollutants consist of bacteria that can harm our water supply, beaches, fish and shellfish. Nutrients will cause algal blooms and when paired with increased sediment loads will block sunlight from reaching aquatic plants. Pesticides and heavy metals will be found in runoff pollutants as well creating a deadly concoction for aquatic life and humans if consumed.

Streams can be classified into management categories, sensitive, impacted, damaged and severely damaged. Sensitive streams have less than 10% impervious cover in their watershed and are considered healthy streams with good water quality. They support aquatic life and have the potential to be in excellent condition, however they are very vulnerable to development. In order to keep these streams from getting worse it requires the greatest level of protection including land conservation. Impacted streams' watersheds are between 10 and 25% impervious cover and are considered a classic suburban stream. The water quality depends on watershed protection techniques and how strongly they are enforced. These streams can support fairly diverse aquatic life, however stream bank erosion is noticeable. These streams require extensive protection and firm stormwater management. Any stream's watershed that is between 25 and 60% impervious cover is categorized as a damaged stream. These have highly eroded channels and very poor water quality. They support very few species and zero sensitive species and the use of the stream is limited due to health concerns. A stream of this state requires careful restoration. Community involvement and stewardship becomes necessary to raise awareness and in hopes to improve water and habitat quality. The final category is severely damaged and streams located here have in excess of 65% impervious cover in the watershed. Channels are so eroded that they become highly modified and have few natural features and it may even be necessary to channelize with concrete. They have very poor water quality and almost no aquatic life. The stream is irretrievable as a natural stream. Pollution prevention can help reduce the pollutants delivered downstream and that is all that can be done to help a stream in this state ("Why Watersheds?").

#### **4.4 Common Themes for Watershed Management**

The following are several common themes found throughout the Lynnhaven watershed that need to be addressed and are the rationale in creating a Watershed Management Plan:

- Water quality is a concern in all of our waterways, however some are more severe than others. We are constantly dealing with non-point pollution as a source for this problem. New rules and regulations are currently being created to address this issue.
- The growth of the community and environmentally friendly ways to cope is something that is noticed through the watershed. Low impact design methods are being considered when it comes to new developments as well as redeveloping areas.
- The Lynnhaven was once known for its sought after oyster and bringing this back

Draft

Draft

throughout the watershed is economically and environmentally viable.

- The community needs to be educated on the Lynnhaven Watershed and how to take care of it with issues such as proper lawn and car care techniques, this will also instill stewardship in our citizens
- Buffer restoration along our waterways is eminent to invoke the natural habitat to filter and clean our runoff as well as provide wildlife habitat.

## **5. Existing Conditions and Resources Sensitivity**

### **5.1 Purpose**

The purpose of this section is to establish the current conditions in the watershed with regards to population, land use, water quality, and current programs. Once all of these are laid out, trends will be extrapolated, gaps will be identified and strategies to fill those gaps will be planned.

### **5.2 Demographics**

Virginia Beach's population has increased rapidly since its incorporation as a city in 1963. From 1970 to 2000, the City's population increased 150%. Rapid growth is expected to continue, with projections from the HRPDC putting the population of the City at half a million by the year 2020, if not sooner.

The population of the Lynnhaven Watershed was around 206,000 in 2000.

#### **Virginia Beach Population**

<b>1970</b>	<b>1980</b>	<b>1990</b>	<b>2000</b>
<b>172,106</b>	<b>262,199</b>	<b>393,069</b>	<b>425,257</b>

#### **Population Density (Figure 6):**

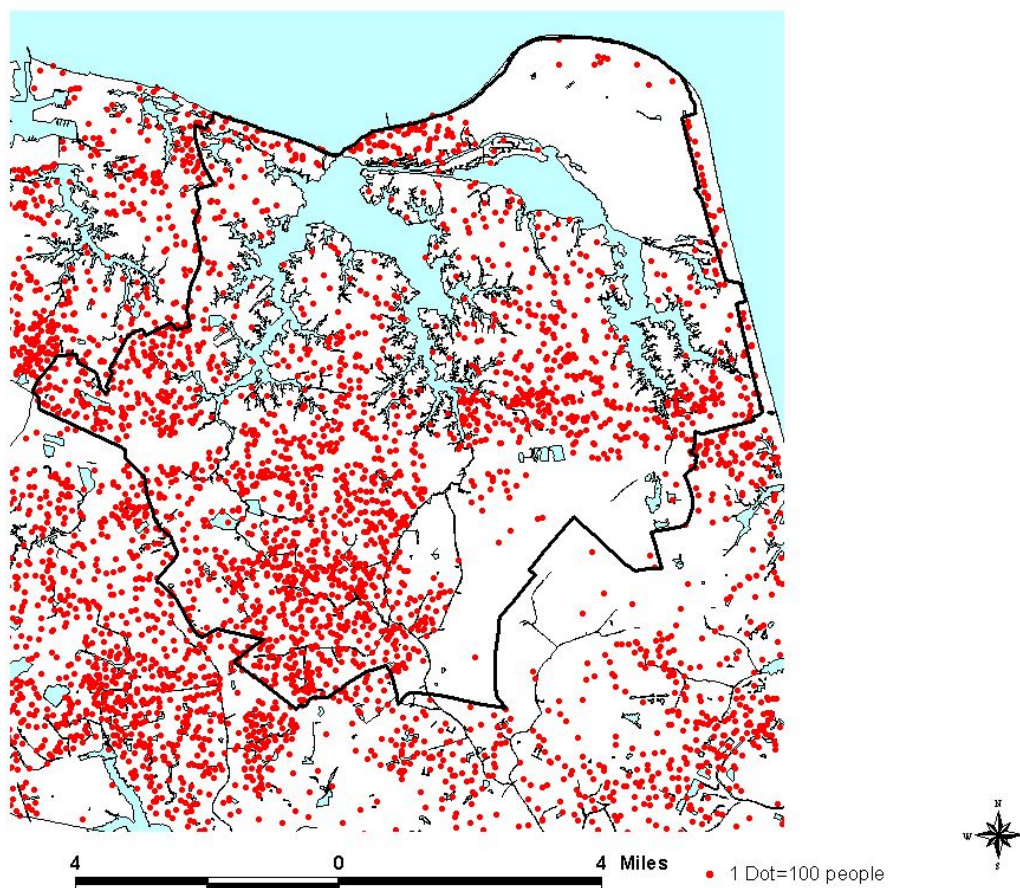


Figure 6

### 5.2.1 Cultural History and Relationship to the Resource

The oysterman is an enduring image of Virginia Beach's past. At one time, many men made their livelihood by harvesting oysters from the river's bottom. Even today, commercial fisherman and crabbers earn a living from the Lynnhaven. The water is a big part of life in Virginia Beach. Boating and watercraft sales, marinas, seafood restaurants are prominent fixtures in many lives.

### 5.2.2 Current Population and Trends/Implications for Watershed Management

With its large military population, Virginia Beach has a highly mobile and somewhat transient population. In 2000, the national average for the amount of people who changed residences in the previous year was 16.1%, while in 2001; the number for Virginia Beach was 19%. The national average for people who had moved within the same city or county was 9%, while in Virginia Beach it was 8%. 3.3% of the U.S. population moved within the same state during that time, compared with 5% in Virginia Beach, and 3.1% of the national

Draft

population moved from one state to another during that year, compared with 6% of Virginia Beach citizens. So on average, Virginia Beach has more new residents each year than the national average, with a larger percentage of those people coming from out of state.

	Total % moved	Moved within same city/county	Moved within same state	Moved from a different state	Moved from abroad
Virginia Beach	19.0	8.0	5.0	6.0	<0.5
Nation-wide	16.1	9.0	3.3	3.1	0.6

(U.S. Census Bureau)

It can be concluded, then, that the large amount of turnover in Virginia Beach's population and the growing number of new residents that are added each year means that there are many people in the City who, being new to the area, are unaware of the environmental concerns of the area. Every effort should be made to educate new citizens about the Lynnhaven River and what the City and other agencies hope to accomplish in restoring the river's former pristine condition.

#### **5.2.2.1 Increasing Economic Standard of Living**

The median age for Virginia Beach citizens has also been steadily increasing over the past few decades. In 1980 it was 26.9, in 1990, 28.9, and by 2000 it was 32.7. Between 1990 and 2000, the percentage of citizens age 65 and over went from 5.9% to 8.4%.

The median income for households in Virginia Beach also increased rapidly in the past decade. In 1990 it was \$36,700 (Virginia Beach Comprehensive Plan, 1997) and in 2000 it was \$53,242. (U.S. Census Bureau).

### **5.3 Water Resources and Water Quality**

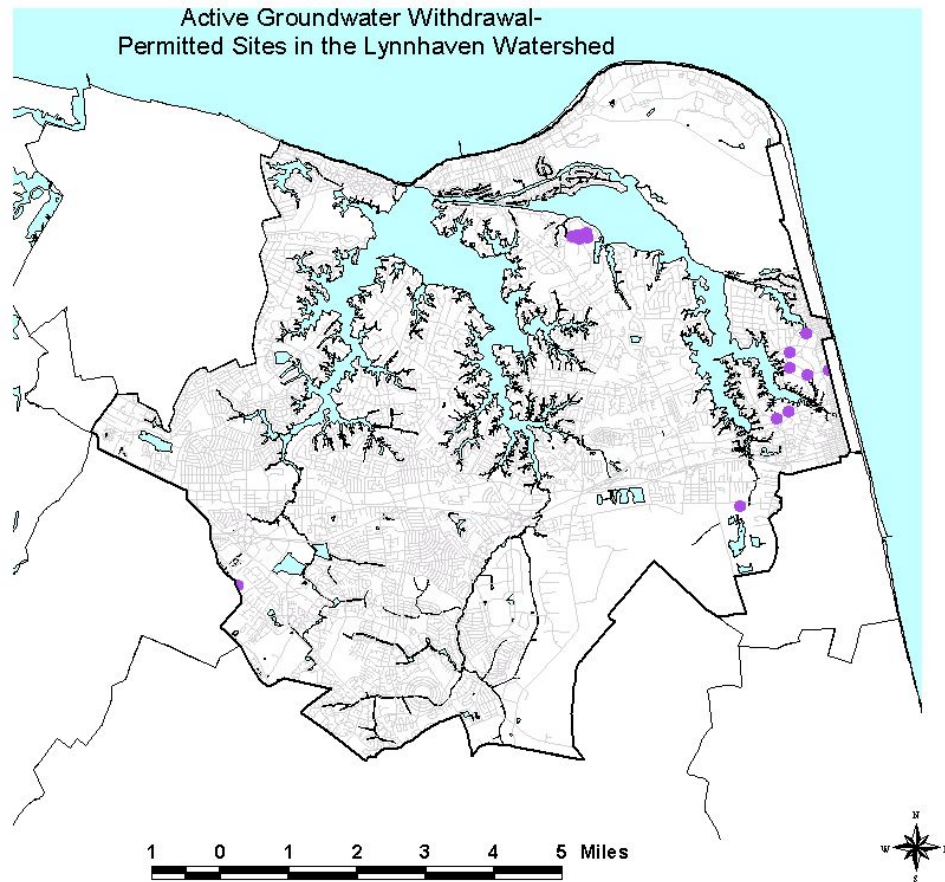
#### **5.3.1 Hydrology and Groundwater**

Virginia Beach has several shallow aquifers, the Columbia aquifer, the Yorktown confining unit, and the Yorktown-Eastover aquifer. The Columbia aquifer overlays the Yorktown confining unit and consists mainly of sandy surficial deposits. The Yorktown confining unit consists of very fine sandy to silty clay deposits and overlays the geologic unit known as the Yorktown formation. The Yorktown-Eastover aquifer is the sandy deposits of the Yorktown formation. The sandy, porous nature of the aquifers allows periodic freshwater recharging, leaving the shallow aquifers vulnerable to land use changes and disturbances, toxic spills, and pollution (USGS).

Draft

Most residences in the Lynnhaven Watershed are on City water, which comes from Lake Gaston, a reservoir about a hundred miles west of Virginia Beach. However, some residences still use well water for drinking and, more often, watering their gardens.

Certain entities use large amounts of water in their day-to-day operations and use groundwater instead of city water to save money. These entities, if they withdraw more than 300,000 gallons of water a month, are required to obtain a permit from the DEQ for their activities.



**Figure 7**

Careful monitoring of major groundwater withdrawals is important to surround owners of small wells, because if too much water is withdrawn from the aquifer in one location, a “cone of depression” can develop around that area, leading to dry wells in nearby locations. (Figure 8)

Draft



Draft

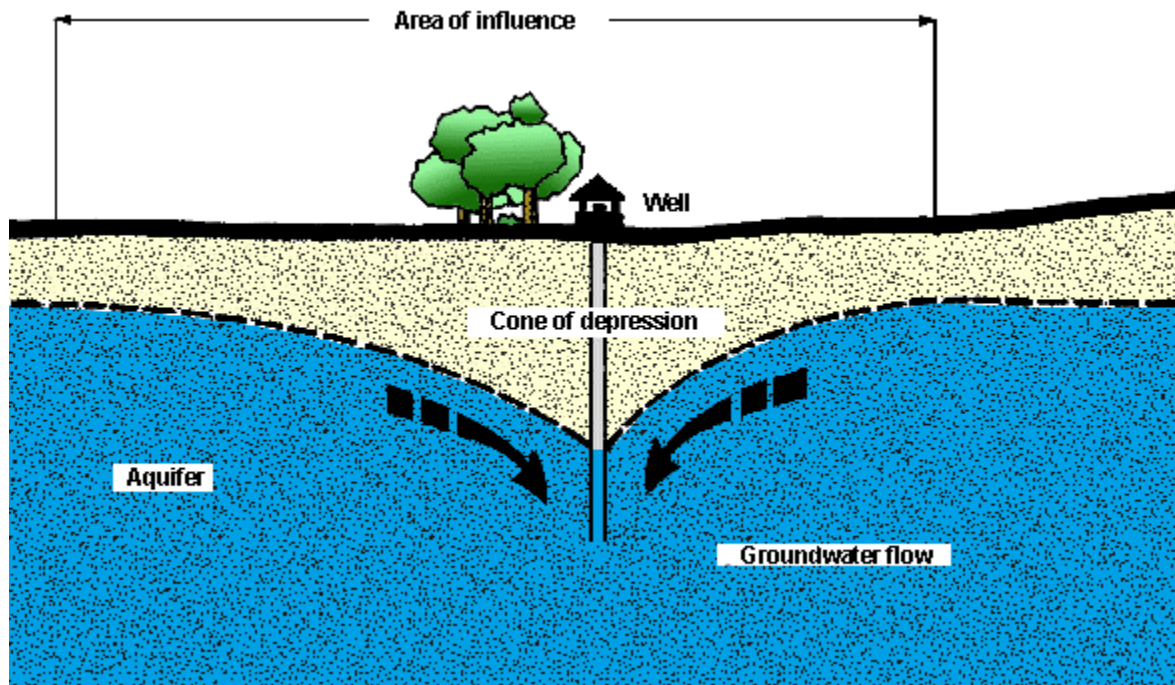


Figure 8

(from <http://groundwater.oregonstate.edu/under/wells.html>)

### 5.3.2 Precipitation

Annual precipitation in Virginia Beach is around 45", with the highest amounts coming in the summer months. (Figure 9)

**Average precipitation in inches by month (Source: The Weather Channel)**

Draft

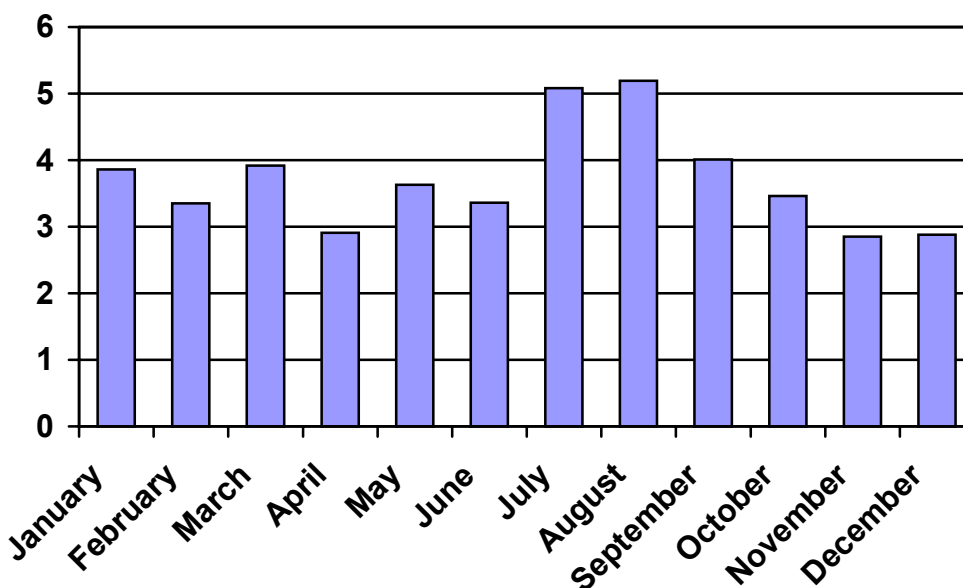


Figure 9

### 5.3.3 Surface Water

Surface water in the Lynnhaven Watershed covers approximately 5,100 acres, or 10% of the total area. The Lynnhaven River has 150 miles of shoreline in the Eastern and Western Branches and Broad and Linkhorn Bays, and 139 miles of shoreline from other lakes and waterways in the watershed.

#### 5.3.3.1 Monitoring Water Quality

Virginia Beach does not perform water quality monitoring or monitoring of the stormwater system during rain events, but they do perform dry weather monitoring to test for illegal hook-ups to the storm drain system and sewer overflows. Surface water quality tests are performed by the Department of Environmental Quality (DEQ) and by citizen monitors for the Alliance for the Chesapeake Bay (ACB). The DEQ has 14 monitoring sites in the Lynnhaven Watershed. Parameters tested for vary from station to station and include but are not limited to, water temperature, pH, dissolved oxygen, salinity, conductivity, ammonia, nitrates, phosphorus, chlorophyll, total suspended solids, and particulate carbon, nitrogen, and phosphorus. The ACB has three active monitoring sites in the Lynnhaven Watershed. Parameters measured by the citizen volunteers are water temperature, pH, dissolved oxygen, secchi, salinity, and KD\_SD (light attenuation coefficient from secchi depth reading).

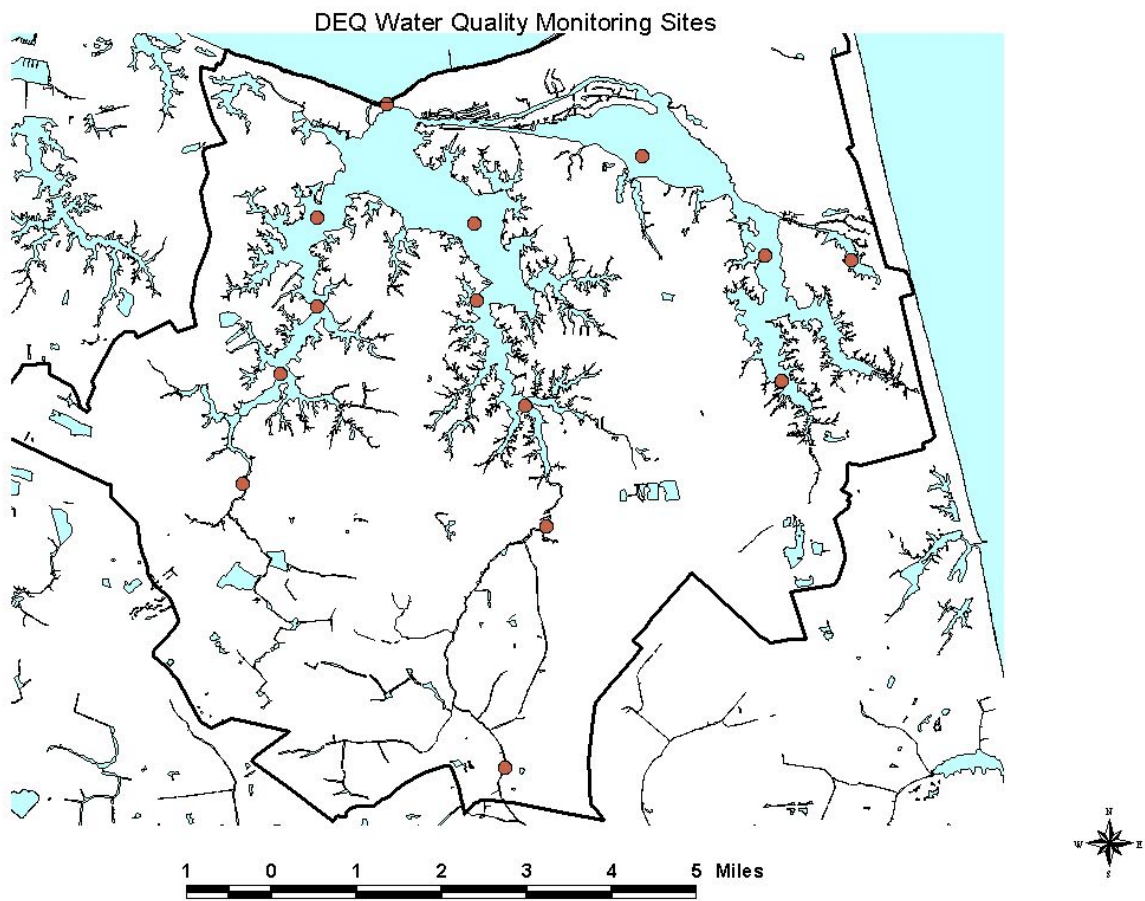


Figure 10

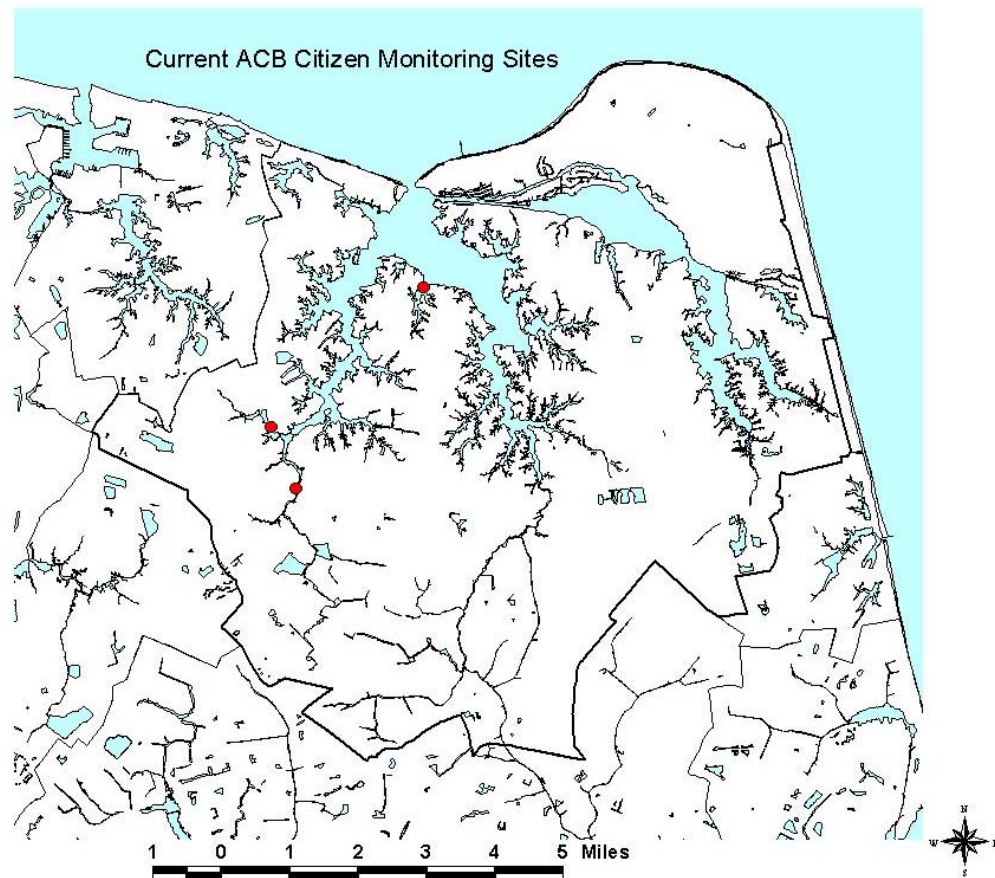


Figure 11

### 5.3.3.2 Trends

## 5.4 Subwatersheds

The Lynnhaven River Watershed is made up of eight subwatersheds, ranging in size from 1,973 acres to 12,789 acres. Some consist of spacious residential lots and a large amount of open water, others are made up of densely packed residential and commercial lots with a high percentage of impervious cover and low amounts of water and natural area. The subwatersheds have been broken out and described according to land use classification, and issues specific to each area is addressed.

Terminology used in this section to classify the subwatersheds is taken from a widely used classification system that looks at impervious cover to determine the condition of watersheds. Less than 10% impervious cover places a subwatershed in the *sensitive* category. Impervious

Draft

cover of 10-25% places a subwatershed in the *impacted* category. Impervious cover of greater than 25% places a subwatershed in the *non-supporting* category.

### 5.4.1 Subwatershed 3

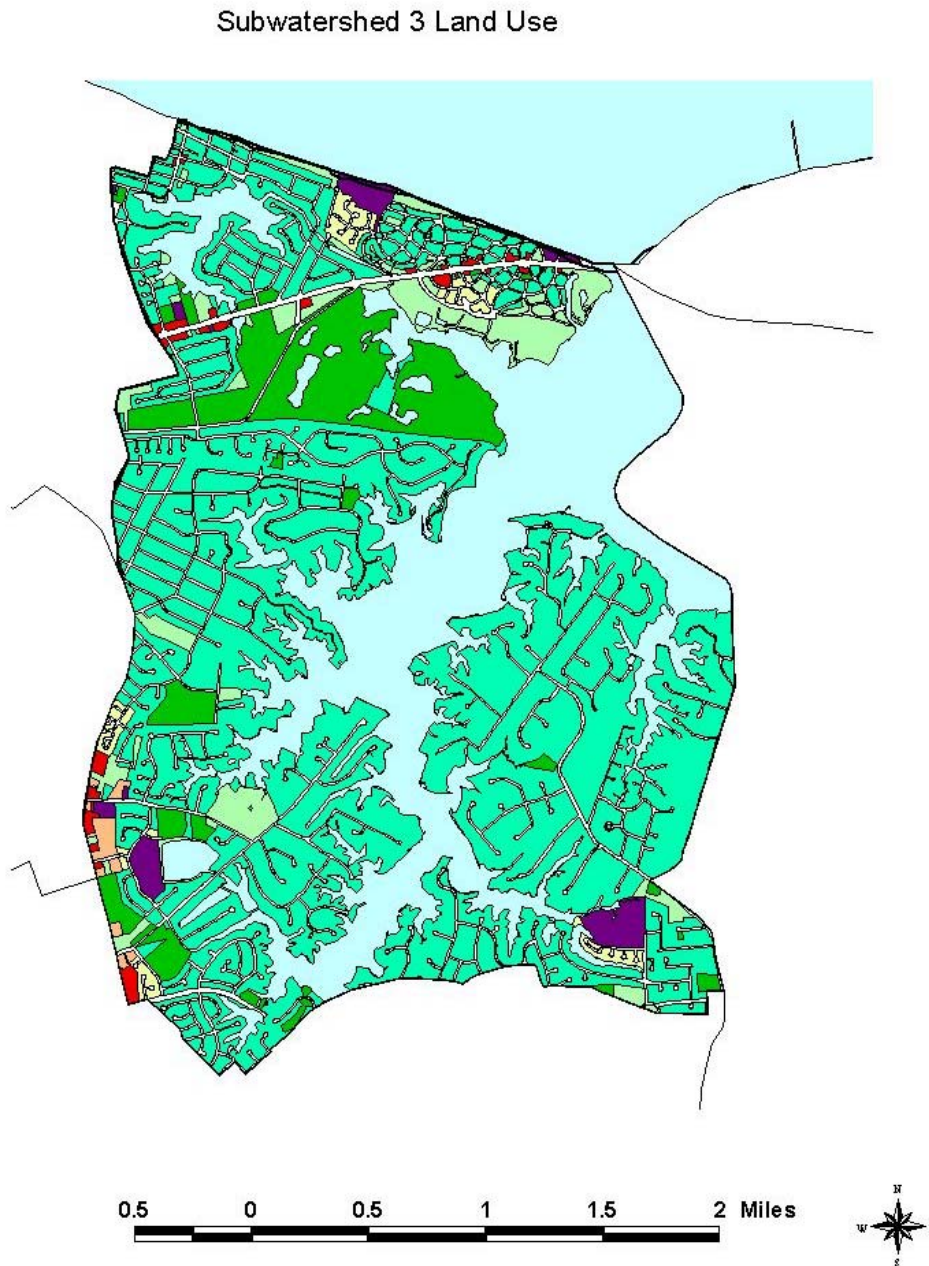


Figure 12

Draft

Draft

**Watershed 3 stats:**

Land Use Type	Acres	% of watershed
Single Family	2621	48.9
Water	1511	28.2
Public/Semi-Public	397	7.4
Street Network	350	6.5
Undeveloped	290	5.4
Multi-Family	74	1.4
Townhouse	56	1.0
Commercial	33	0.6
Office	23	0.4
<b>Total</b>	<b>5355</b>	<b>100.0*</b>

\*Due to rounding, numbers may not add up to exactly 100%

**Constraints:**

Type	Measurement	% of watershed
RPA	990 acres	18.5
AICUZ 65-70db	None	
70-75db	None	
>75db	None	
Impervious cover from street network and buildings	659 acres	
Shoreline	93.8 miles	

22 major stormwater outfalls

125 minor stormwater outfalls

7 stormwater management ponds

The land use in subwatershed 3 is primarily single family residential, with open water being a large part of the subwatershed as well. Most of the plans for water quality improvement here should focus on homeowner education on matters such as pet waste clean-up, proper fertilization amounts, and planting riparian buffers along waterfront properties. Impervious cover is relatively low, only 12.3 % from streets and buildings, placing the subwatershed in the *impacted* category. Undeveloped properties total 5.4% of the total area, with much of that being a tract of land near Lynnhaven Inlet known as the McClesky property. This piece of land is highly desirable, both from environmental and development standpoints. The land contains sand dunes, undisturbed scrub vegetation, and many shallow lagoons suitable for oyster hatcheries. Every effort should be made to secure this land for passive open space.

Draft



Draft

Bow Creek Golf Course is another large piece of property within the subwatershed. Many environmentally friendly efforts have already been undertaken there. The golf course, which is private, should be an example to all within the subwatershed, both city-owned and private, and it should take steps to achieve Audobon certification as well.

#### 5.4.2 Subwatershed 4

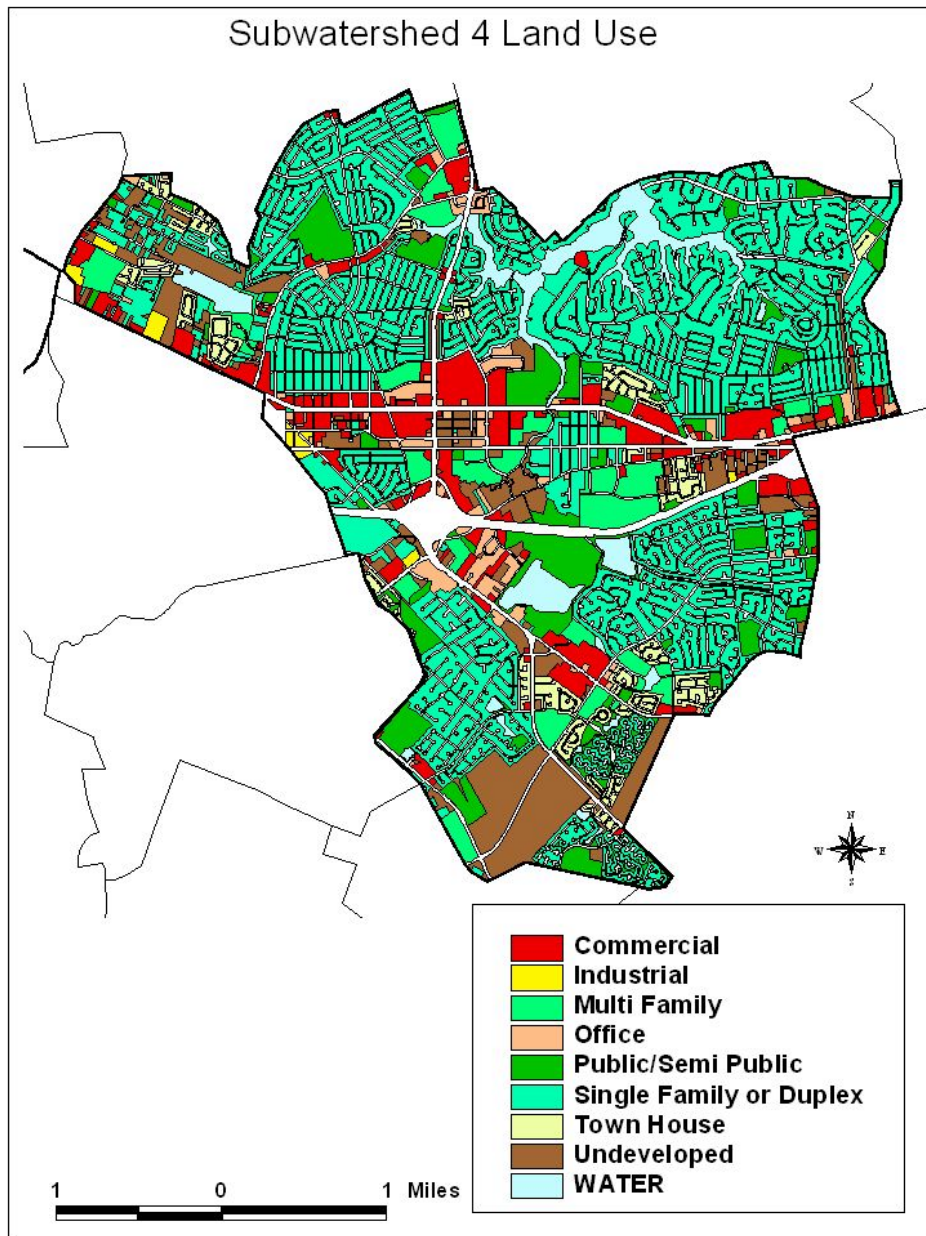


Figure 13

Draft



**Watershed 4 stats**

Land Use Type	Acres	% of Watershed
Single Family/Duplex	3238	39.9
Street Network	1589	19.6
Undeveloped	722	8.9
Commercial	615	7.6
Public/Semi-Public	598	7.4
Water	462	5.7
Multi-family	452	5.6
Town House	278	3.4
Office	204	2.5
Industrial	43	0.5
<b>Total</b>	<b>8,107</b>	<b>100.0*</b>

\*Due to rounding, numbers may not add up to exactly 100%

102 major stormwater outfalls

292 minor stormwater outfalls

8 stormwater management ponds

**Constraints:**

Feature	Measurement	% of Watershed
RPA	500 acres	6.2
AICUZ 65-70 db	36	0.4
70-75 db	None	
< 75 db	None	
Impervious cover from street network and buildings	<b>957 acres</b>	<b>11.8 need to check these</b>
Shoreline	76.8 miles	


Watershed 4 is the most seriously degraded subwatershed in the Lynnhaven River watershed.

It contains two impaired waterways identified by the Department of Environmental Quality, Thalia Creek and the Western Branch of the Lynnhaven River. In Thalia Creek, the impairment is due to high fecal coliform levels, and low dissolved oxygen. In the Western Branch, the impairment is due to the high fecal coliform levels.

The primary land use in 4 is single family, with the second highest being the street network. Interstate 264 transects 4, contributing to the high percentage of street network, along with a number of other major roads and a dense commercial area. Waterways are a relatively low percentage of the watershed, as compared to other subwatersheds in the Lynnhaven. While the undeveloped area is relatively high, much of it will be lost to development pressures in the

Draft

near future, as available land becomes a premium. Buildings coupled with street networks equal 31.4% impervious cover alone! This doesn't include sidewalks, parking lots, and driveways, which will contribute a large amount due to the large commercial area. This classifies Watershed 4 as a *non-supporting watershed*.

There are 8 stormwater management ponds in the subwatershed, and their associated Best Management Practice areas cover nearly 43% of number 4. There are also a large number of major and minor stormwater outfalls relative to some of the other subwatersheds. Due to the large amount of impervious cover and the low water quality in number 4, looking at ways the effectiveness of the stormwater management ponds could be improved should be a priority. Additionally, retrofits of the stormwater drains leading to outfalls that do not pass through a BMP should be considered to improve water quality. Since much of the fecal coliform found in the waterways can be attributed to pet waste, intense efforts to educate pet owners on cleaning up after their pets should be a priority. Non-point source pollution must also be targeted, as nitrogen and phosphorus-heavy runoffs from fertilized lawns are a cause of the low dissolved oxygen conditions. 

#### **5.4.3 Subwatershed 5**

Draft

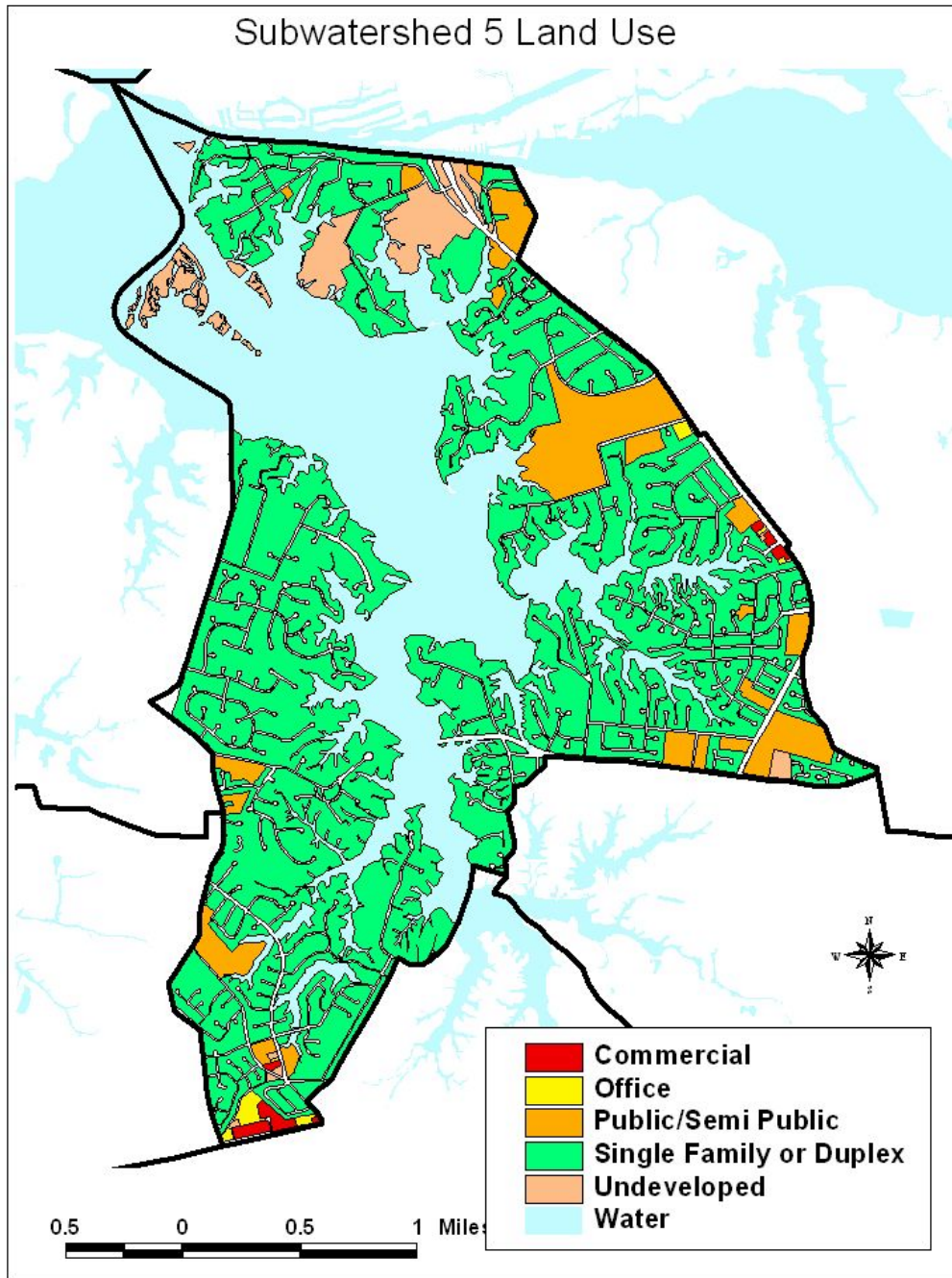


Figure 14

**Subwatershed 5 Narrative:**

Land Use Type	Acres	% of Watershed
Single Family/Duplex	2269	49.2

Draft

Water	1577	34.2
Street Network	377	8.2
Public/Semi-Public	297	6.4
Undeveloped	150	3.2
Commercial	18	0.4
Office	15	0.3
<b>Total</b>	4,608	100.0*

\*Due to rounding, numbers may not add up to exactly 100%

Constraining features:

Feature	Measurement	% of watershed
RPA	1058 acres	23.0
AICUZ zone 65-70db	736 acres	16.0
AICUZ zone 70-75db	44 acres	0.9
Impervious cover from street network and buildings	603 acres	13.1
Shoreline	87.8 miles	

Subwatershed 5 is the subwatershed for the Eastern Branch of the Lynnhaven River. 34.2% of the watershed area is open water, while the largest land use type is single family residential (see Table) Since such a large percentage of the subwatershed is residential, the focus here should be on public education about the benefits of riparian buffers, proper fertilization, and clean-up of pet waste.

There are six stormwater management ponds in the subwatershed 139 minor stormwater outfalls, and 21 major stormwater outfalls.

The impervious cover from buildings and streets is 13.1%, putting subwatershed 5 in the *impacted* category. The Resource Protection Area is 23% of the subwatershed, or 34.9% of the land area. Another constraining feature are two AICUZ zones. (see Table)

#### 5.4.4 Subwatershed 6

Draft

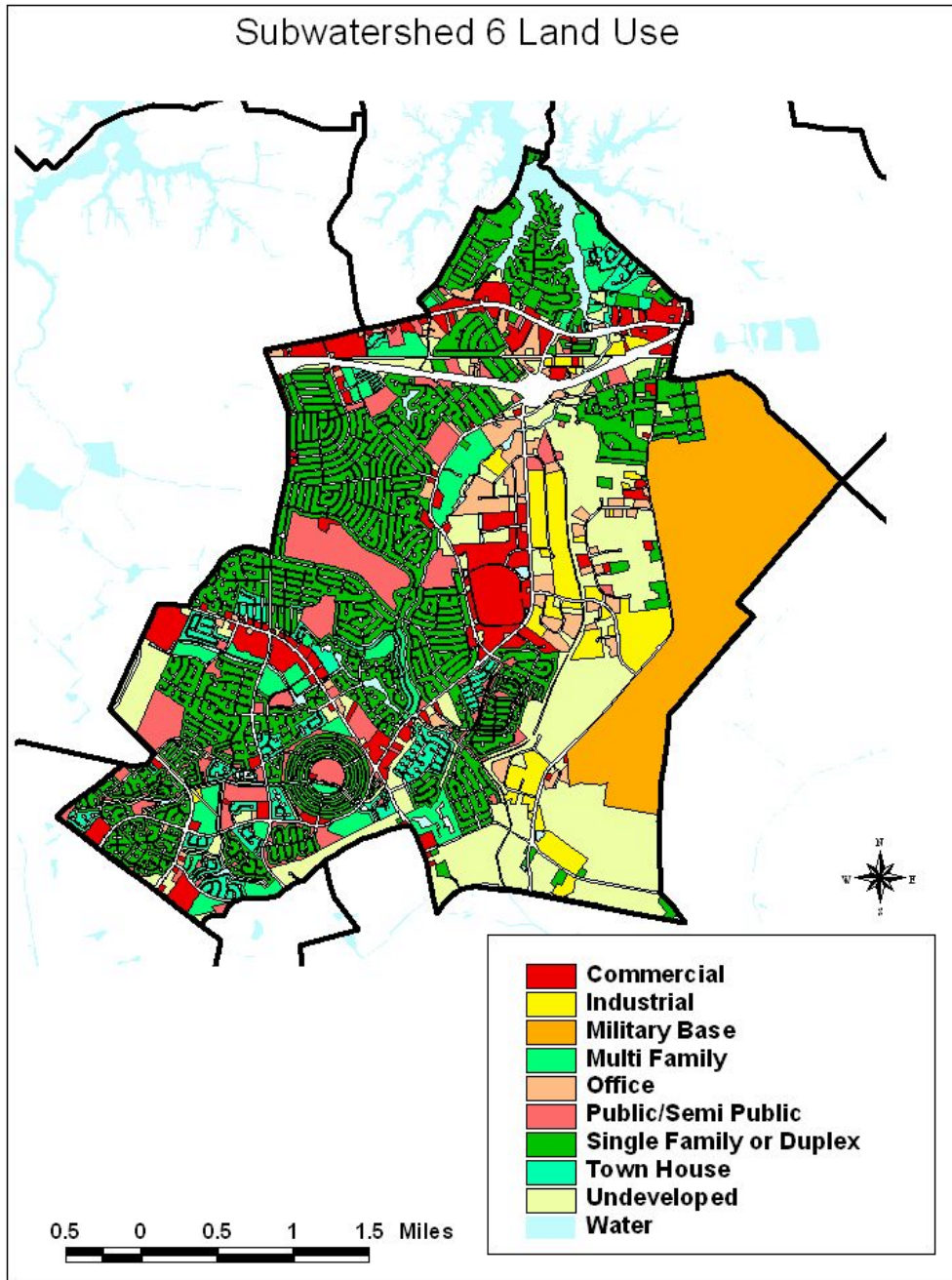


Figure 15

**Watershed 6 stats:**

Feature	Acres	% of Watershed
Single Family/Duplex	2279	25.3

Draft

Undeveloped	1499	16.7
Street Network	1299	14.4
Military Base (Oceana)	1200	13.3
Commercial	614	6.8
Public/Semi-Public	564	6.3
Multi-family	384	4.3
Industrial	354	3.9
Office	279	3.1
Water	276	3.1
Town House	31	0.3
<b>Total</b>	8999 acres	100.0*

\*Due to rounding, numbers may not add up to exactly 100%

Constraints:

Feature	Measurement	% of watershed
RPA	1215 acres	13.5
AICUZ >75 db	4832 acres	53.7
70-75 db	1237 acres	13.7
65-70 db	1524 acres	16.9
Impervious cover from street network and buildings	2169 acres	24.1
Shoreline	63.7 miles	

Major stormwater outfalls: 165

Minor stormwater outfalls: 317

Stormwater management ponds: 6

Watershed 6 is another seriously degraded subwatershed of the Lynnhaven Watershed. It contains London Bridge Creek, another waterway identified by the Department of Environmental Quality as an impaired waterway due to low dissolved oxygen and high fecal coliform levels.

Draft

Draft

The highest land use in 6 is single family. Since pet waste is a likely culprit of the high fecal coliform levels, pet owners should be targeted with an education campaign on cleaning up after their pets. Low dissolved oxygen can be caused by a number of factors, but a likely culprit is too much algae in the waterways, and overgrowth of algae can be caused by too much fertilizer entering the water and promoting algae growth. Homeowners need to be educated on the adverse effects of over-fertilization.

The next highest land use is undeveloped land. There is a high percentage of undeveloped land in subwatershed 6 due to the proximity to Oceana Naval Air Station (which is 13% of the subwatershed) and the fact that more than half of the 6 is in the greater than 75 db AICUZ category (see constraints table). The undeveloped land should be used for additional water quality protection, such as planting of riparian buffers.

Buildings coupled with street networks equal 24.1% impervious cover in the subwatershed. Once parking lots, driveways, sidewalks, and runways at Oceana are factored in, impervious cover will be over 25%, placing 6 in the *non-supporting* category.

There are 6 stormwater management ponds in the subwatershed, 5 of which are concentrated in the southwest corner. Additional stormwater management upgrades should be considered downstream, either in the form of storm drain outfall retrofits or construction of new stormwater management ponds.

#### **5.4.5 Subwatershed 7**



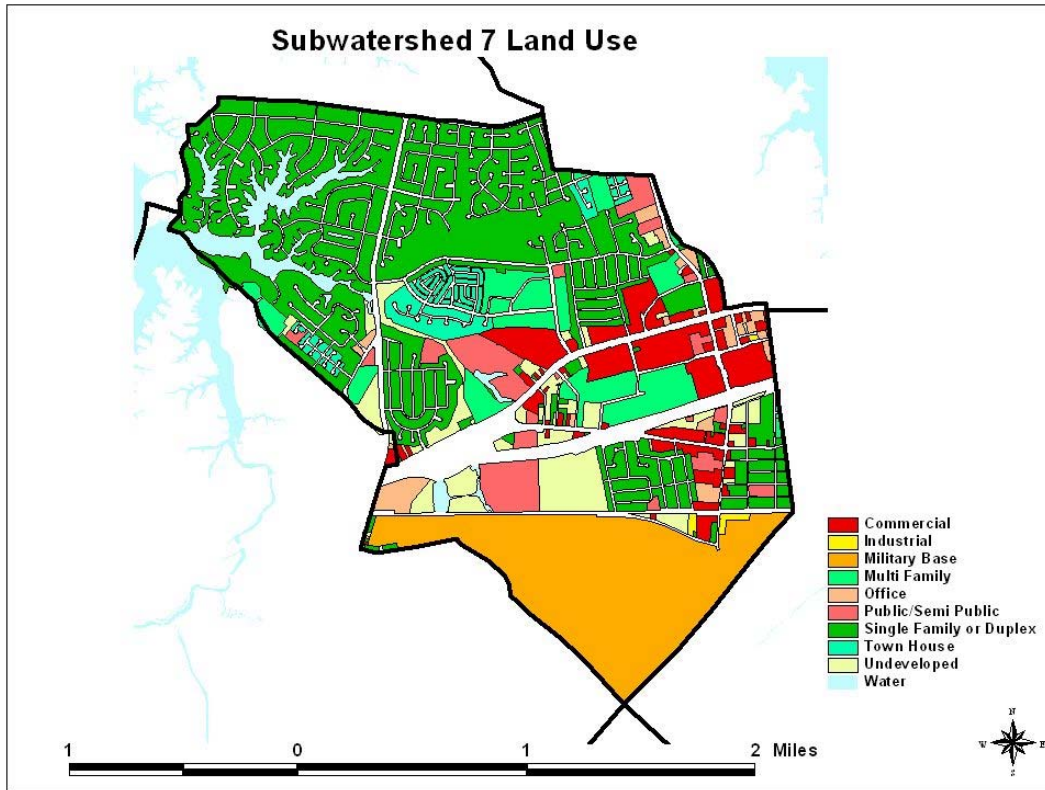


Figure 16

**Watershed 7 stats:**

Feature	Acres	% of Watershed
Single Family/Duplex	897	34.1
Street Network	488	18.6
Military Base (Oceana)	422	16.1
Commercial	198	7.5
Multi-Family	171	6.5
Undeveloped	163	6.2
Public/Semi-Public	119	4.5
Townhouse	74	2.8
Office	52	1.9
Water	23	0.9

Draft

Industrial	6	0.2
<b>Total</b>	2628	100.0*

\*Due to rounding, numbers may not add up to exactly 100%

Constraints:

Feature	Measurement	% of Watershed
RPA	418 acres	18.0
AICUZ 65-70 db	197 acres	7.5
70-75 db	396 acres	15.0
<75 db	2035 acres	77.5
Impervious cover from street network and buildings	733 acres	27.9
Shoreline	20.8 miles	

25 major stormwater outfalls

119 minor stormwater outfalls

5 stormwater management ponds

Subwatershed 7 is one of the smaller subwatersheds of the Lynnhaven River watershed. It is characterized by single-family dwellings, a large commercial corridor, and the northern portion of the Ocean Naval Air Station base. It is transected by I-264, Virginia Beach Blvd, and Laskin Rd, 3 large road systems, contributing to the large percentage of street network and the overall large amount of impervious cover. Street network and buildings alone add up to nearly 28% impervious cover, and most of the Oceana property in the watershed is runway systems, adding approximately another 10% of impervious cover. Impervious cover of nearly 40% puts subwatershed 7 in the *non-supporting* category. Water quality in the Eastern Branch of the Lynnhaven is still high enough that it is not on the DEQ's impaired list, but given the high amount of impervious cover in subwatershed 7, steps should be taken to ensure that water quality does not degrade.

Storm drain retrofits, stormwater management pond upgrades, homeowner education, and a bayscaping demo project with a business or strip mall should be done.

#### 5.4.6 Subwatershed 8

Draft

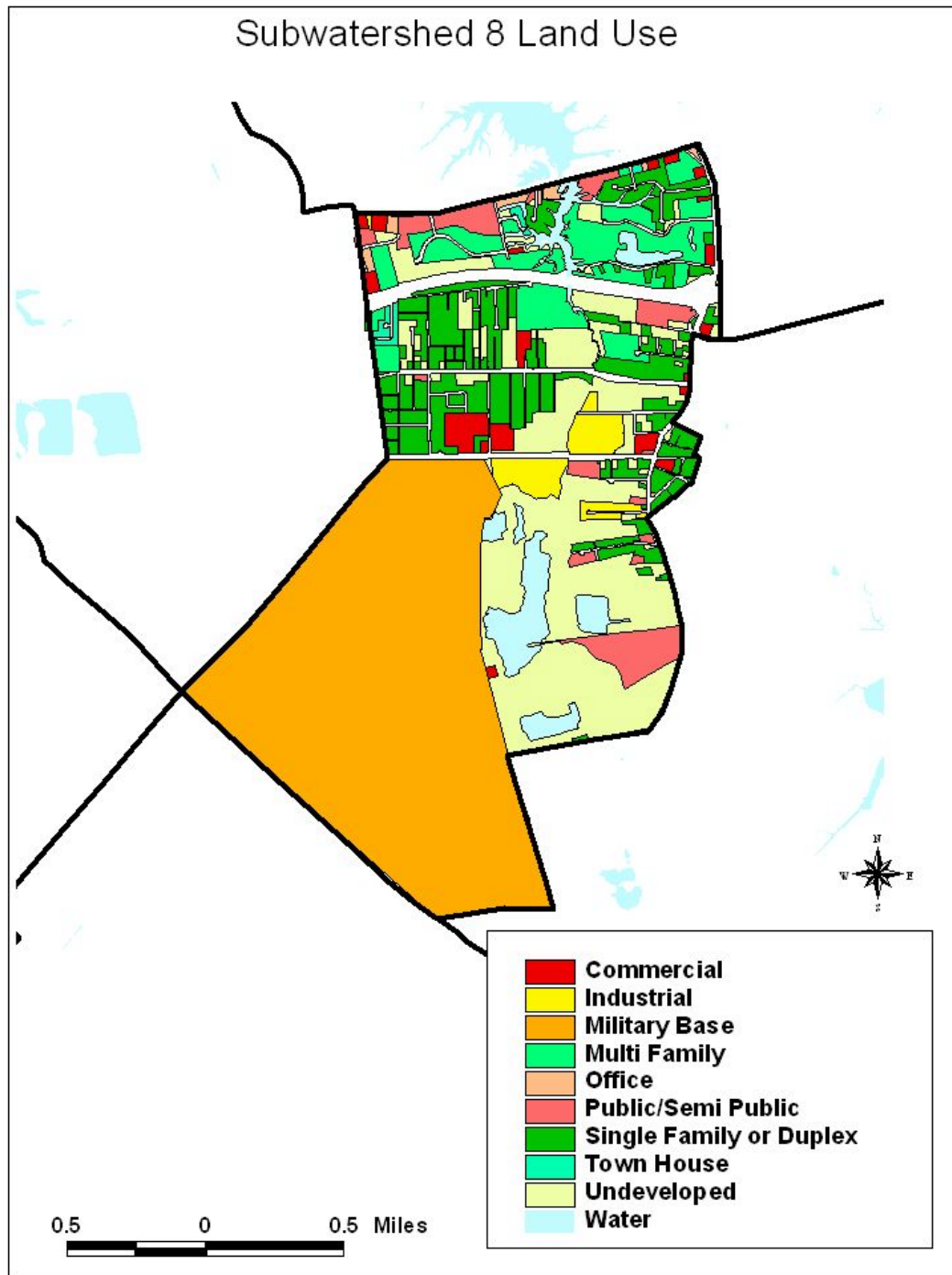


Figure 17

**Watershed 8 stats:**

---

Draft

Feature	Acres	% of Watershed
Military Base (Oceana)	779	39.5
Undeveloped	396	20.1
Single Family/Duplex	236	11.9
Street Network	140	7.2
Multi-Family	140	7.1
Water	96	4.9
Public/Semi-Public	78	3.9
Industrial	46	2.3
Commercial	40	2.0
Office	10	0.5
Townhouse	8	0.4
Total	1973	100.0*

\*Due to rounding, numbers may not add up to exactly 100%

Constraints:

Feature	Measurement	% of Watershed
RPA	374 acres	19.0
AICUZ 65-70 db	None	
70-75 db	16 acres	0.8
<75 db	1957 acres	99.2
Impervious cover from street network and buildings	219 acres	11.1
Shoreline	18.4 miles	

5 major stormwater outfalls  
24 minor stormwater outfalls  
1 stormwater management pond

Subwatershed 8 is one of three in the Lynnhaven River Watershed that contains a portion of Oceana Naval Air Station. Oceana composes nearly 40% of the subwatershed. A partnership with Oceana should be established to promote water quality in the Lynnhaven, with additional stormwater management ponds and storm drain retrofits on the base. Undeveloped land makes up another large portion of the land in 8. This is due to the proximity to Oceana and the AICUZ

Draft

Draft  
area.

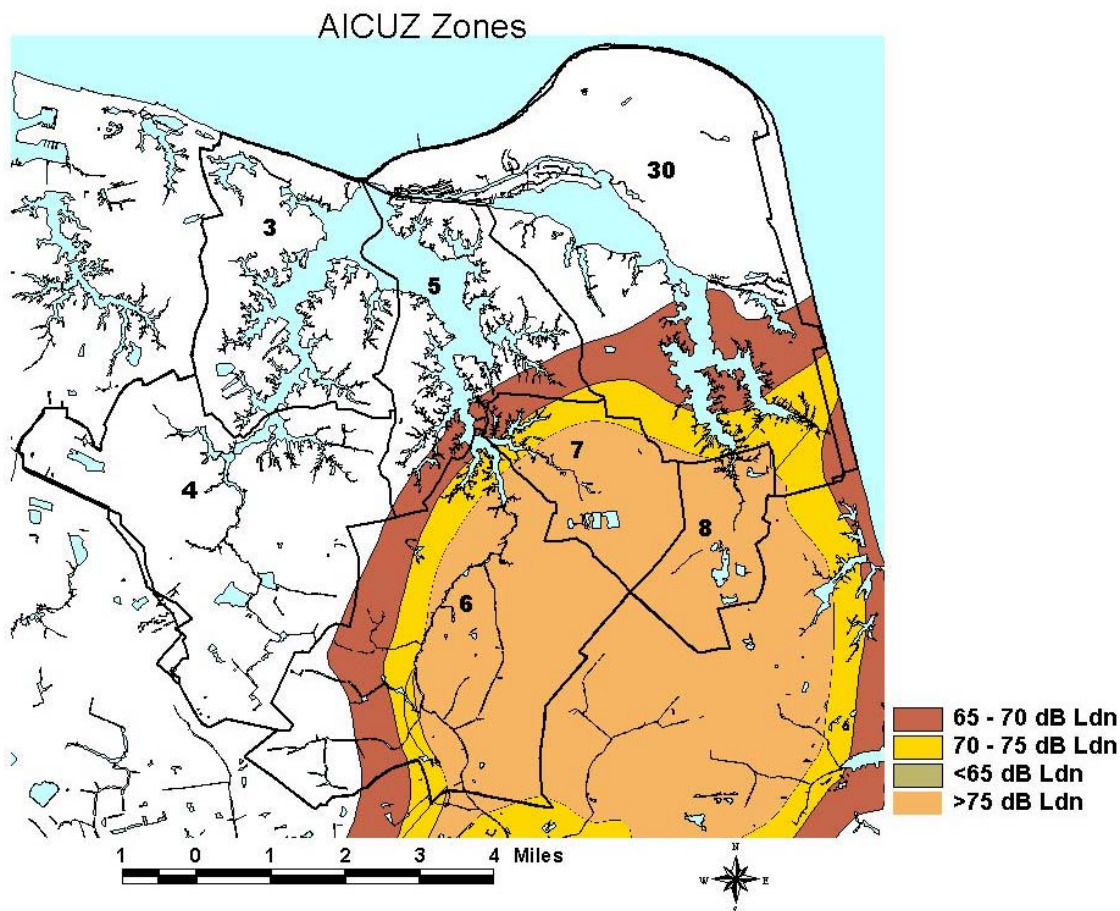
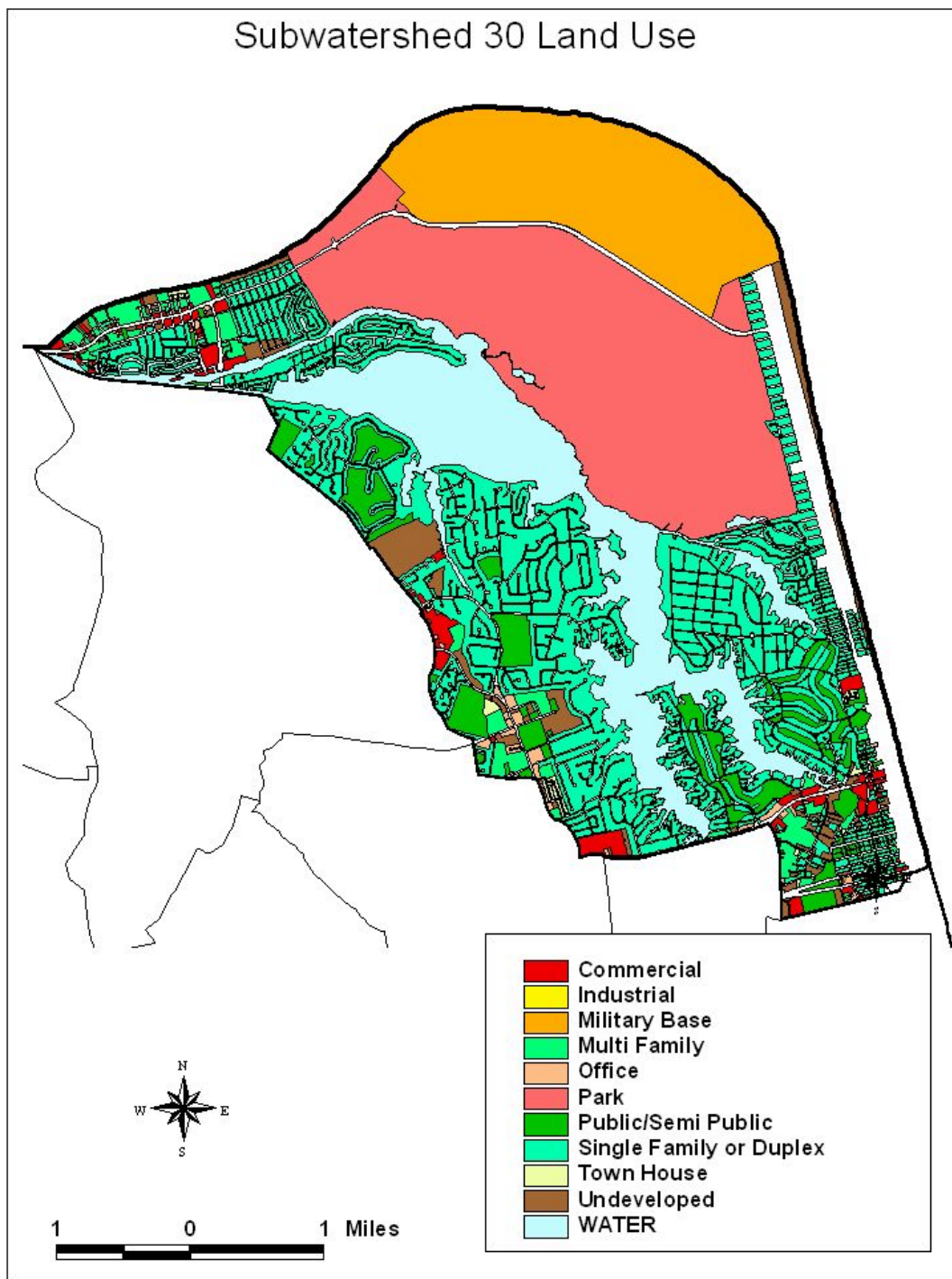


Figure 18

All of subwatershed 8 is in the AICUZ, with all but less than 1% in the >75 db zone. Any further development is greatly restricted in that high level noise zone, which may prove beneficial to water quality. Although certain business types are considered compatible with high noise zones, such as industrial operations or auto repair, making use of the high noise zones for natural areas. Ponds and wetlands cover some of the undeveloped area in the high noise zone; these should be preserved and enhanced. Impervious cover from streets and buildings is just over 11%, with runways on Oceana making up another 4.6%, placing the watershed in the *impacted* category. Subwatershed 8 is at the headwaters of Linkhorn Bay, a high quality waterway in the Lynnhaven Watershed; every effort should be made to preserve that high quality, with retrofits of the storm drains at the headwaters, and riparian buffer restoration along the waterways.

#### 5.4.7 Subwatershed 30

Draft



**Figure 19**

Watershed 30 stats:

Feature	Acres	
---------	-------	--

Draft

Single Family/Duplex	3,344	26.1%
State Park	2,872	22.5%
Water	2,044	16.0%
Ft. Story	1,561	12.2%
Street Network	859	6.7%
Public/Semi-Public	607	4.7%
Undeveloped	424	3.3%
Multi-family	319	2.5%
Commercial	223	1.7%
Other parks	175	1.4%
Office	67	0.5%
Town House	36	0.3%
<b>Total</b>	<b>12,789</b>	<b>100.0</b>

Constraints:

Feature	Measurement	% of Watershed
RPA	5625 acres	24.3
AICUZ 65-70db	1608 acres	12.6
70-75db	2415 acres	18.9
<75db	27 acres	0.2
Impervious cover from street network and buildings	1458 acres	11.4
Shoreline	105 miles	

46 major stormwater outfalls  
185 minor stormwater outfalls  
2 stormwater management ponds

Land Use in Watershed 30 is primarily single family and natural area, First Landing State Park composing nearly one-fourth of the watershed. Ft. Story Army base is also a prominent part of 30. Due to the State Park and larger lot sizes typical of the waterfront and upscale neighborhoods, impervious cover here is at a minimum, 11.4%, making 30 *impacted*.

Stormwater is primarily transported to the waterways by outfalls without any treatment, with the exception of two stormwater management ponds.

Watershed 30 contains the only Submerged Aquatic Vegetation (SAV) in the Lynnhaven Watershed, as of the 2001 aerial survey done by the Virginia Institute of Marine Science (map) SAV is very sensitive and needs a high level of water quality to survive, particularly water clarity. The presence of SAV in Broad Bay indicates that water quality is high there.

Draft



Draft

Since only 3% of the land in Watershed 30 is considered undeveloped, much of the scope of work for it should focus on homeowner education, environmental restoration, and stormwater management upgrades. The state park is most likely a large reason that water quality is so high there and should serve as an example to other subwatersheds as to what a natural area can do for water quality.

## 5.5 Land Use

### 5.5.1 Existing

Land Use/Types in the Lynnhaven River Watershed

Land Use Type	Acreage	% of Watershed
Single Family/Duplex	14750	33.5
Street Network	6028	13.7
Water	5100	11.6
Military Base (Oceana and Ft. Story)	3940	8.9
Undeveloped	3540	8.0
Park (Primarily First Landing State Park)	2876	6.5
Public/Semi-Public	2707	6.1
Commercial	1724	3.9
Multi-Family	1537	3.5
Town house	773	1.8
Office	646	1.5
Industrial	439	1.0

### 5.5.2 Planned

Much of the Lynnhaven River Watershed outside of the state park is already built-out. With restrictions on development in the southern part of the City, the focus on development and redevelopment will continue to be in the northern half of the City. Growing areas will continue to be guided by planning principles leading towards more vertical development in some areas, and more intense commercial development and redevelopment from single-family to duplex and multi-family in others (Virginia Beach Comprehensive Plan, 2003).

### 5.5.3 Shoreline Conditions by Tributary

The following table is a summary of data gathered in 1980 by the Virginia Institute of Marine Science. Detailed updated information is not available but should be considered in the near future.

Tributary	Open Water	Total shoreline	Altered Shoreline*	Percent altered	Wetlands (acres)	Waterfront homes	Boats and
-----------	------------	-----------------	--------------------	-----------------	------------------	------------------	-----------

Draft

Draft

	(acres)	(miles)	(miles)				moorings
Eastern Branch	1504.26	56.75	5.98	10.5	337.17	915	328
Western Branch	1300.57	51.15	8.63	17	306.85	938	552
Broad and Linkhorn Bays	2001.94	68.42	41.48	61	182.3	1395	1815

\*Refers to bulkheads and rip-rap; anything other than a natural shoreline (Walter Priest, VIMS).

#### **5.5.4 Watershed Size**

The Lynnhaven River Watershed is a little over 50,000 acres in size, about one-fourth of the total are of the City. It makes up about two-thirds of the Chesapeake Bay Watershed area in the City.

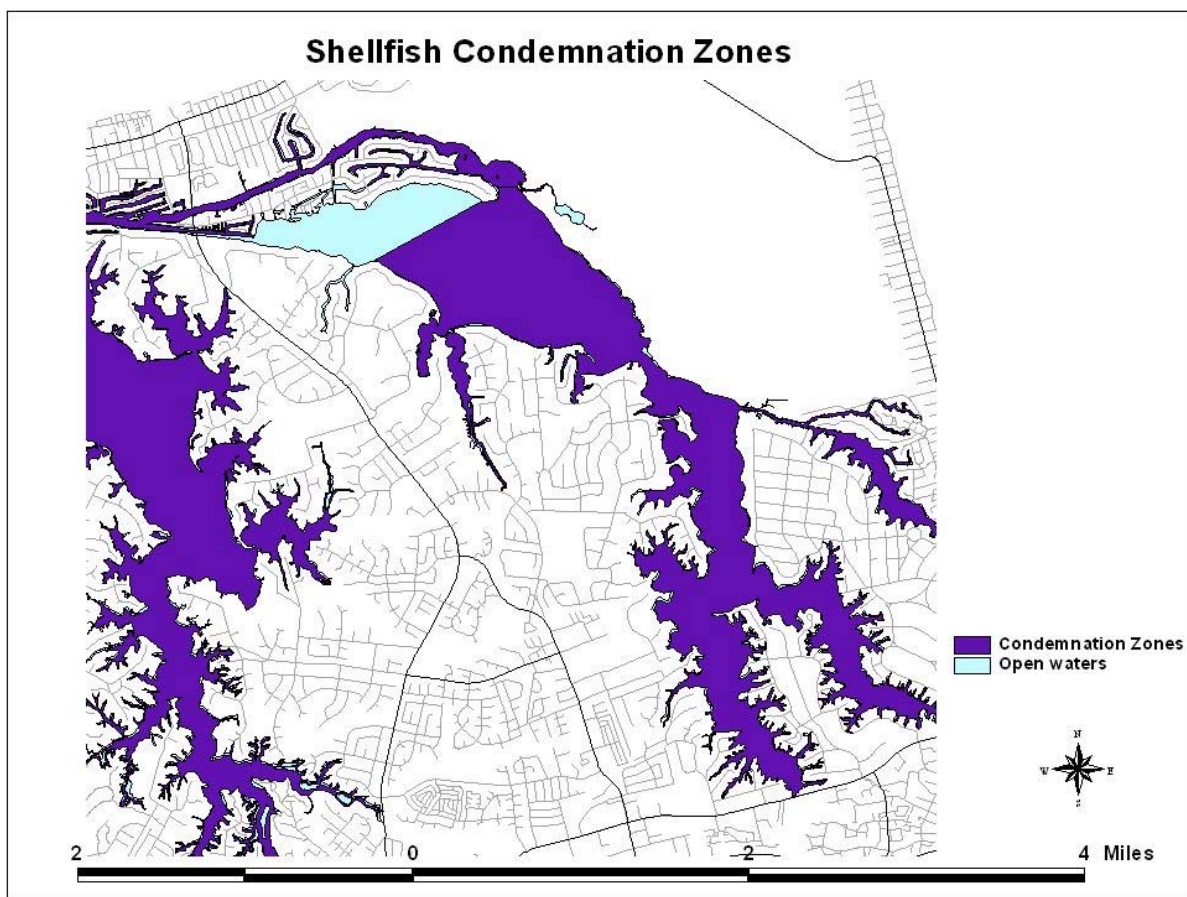
#### **5.6 Designated Uses and Impaired Water Bodies**

According to the DEQ, under the Virginia Water Quality Standards, the Lynnhaven River use designation is recreation such as swimming and boating; propagation and growth of a balanced, indigenous population of aquatic life, including game fish, which might reasonably be expected to inhabit them and the production of edible and marketable natural resources e.g. fish and shellfish (Virginia Department of Environmental Quality). However, the VDH has most of the Lynnhaven condemned for shellfishing.

##### **5.6.1 SHD Shellfish Condemnation Zones**

The Virginia Department of Health Department of Shellfish Sanitation is responsible for condemning water bodies for harvesting of bivalve mollusks for human consumption. The DSS conducts shoreline surveys to note possible pollution sources and conducts water sampling to test for fecal coliform bacteria levels. Most of the Lynnhaven River Watershed is condemned, with the exception of an area in Broad Bay. (Figure 20)

Draft



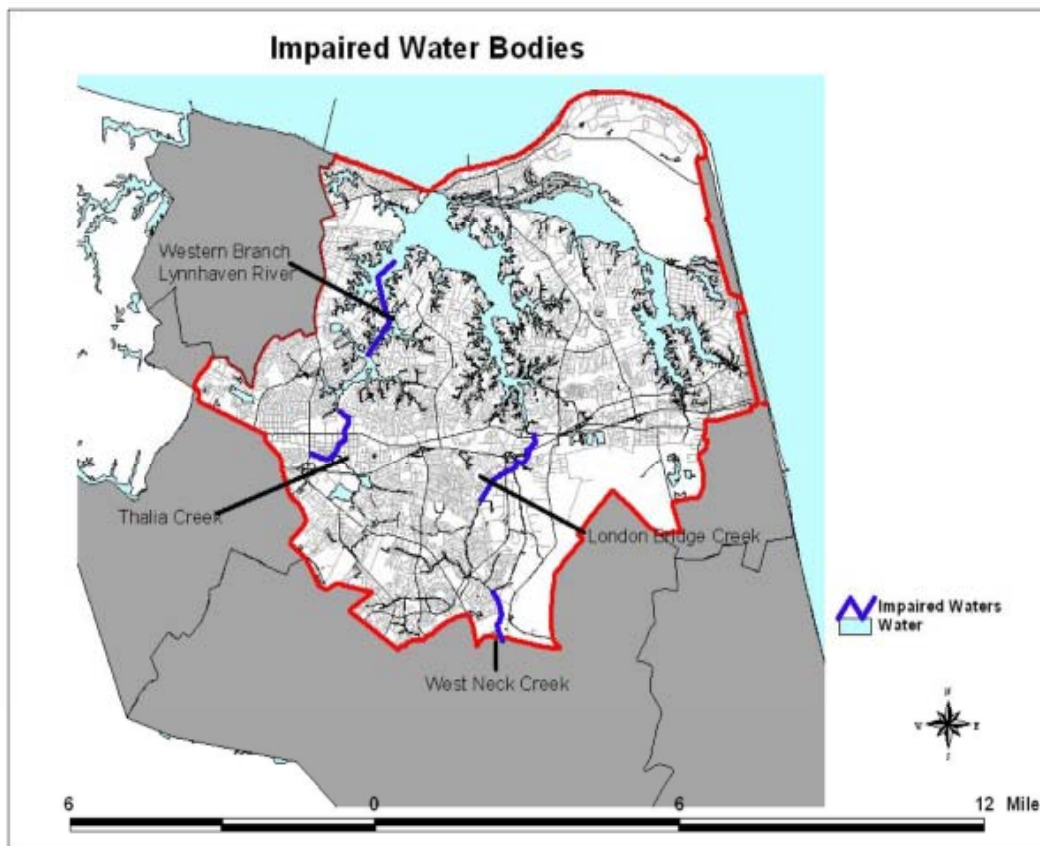
**Figure 20**

(Data source: Virginia Department of Health, Daniel Powell).

### 5.6.2 DEQ Impaired Water Bodies List

The Department of Environmental Quality has the responsibility for monitoring water quality across the state for enforcement of the federal Clean Water Act as well as state environmental laws. Water samples are routinely taken at several locations in Virginia Beach by DEQ staff and citizen volunteers. These samples are tested for a variety of chemical and bacterial parameters.

In 2002, the DEQ developed a list of water bodies for which TMDLs would need to be calculated. These water bodies were designated as impaired based on the water quality data gathered from January 1, 1996 to December 31, 2000. Water bodies in the Lynnhaven River Watershed that are on the Impaired list are Thalia Creek, London Bridge Creek, and West Neck Creek for high fecal coliform and low dissolved oxygen levels, and the Western Branch of the Lynnhaven River for high fecal coliform levels. (Figure 21)



**Figure 21**

The Lynnhaven Watershed is extremely important to the community located within the City of Virginia Beach, but it also plays a role in the health of the Chesapeake Bay. Oysters, crabs, and SAV are all important resources that are indicators of health in the Bay and improve the Bay's health as well.

### **5.7 Regional BMPs**

A regional BMP is usually a pond or lake that is designed to control pollution over a large area, usually 50 acres or more. There are a number of regional BMPs in the Lynnhaven River Watershed (Figure 22).

### 5.7.1 Service Areas

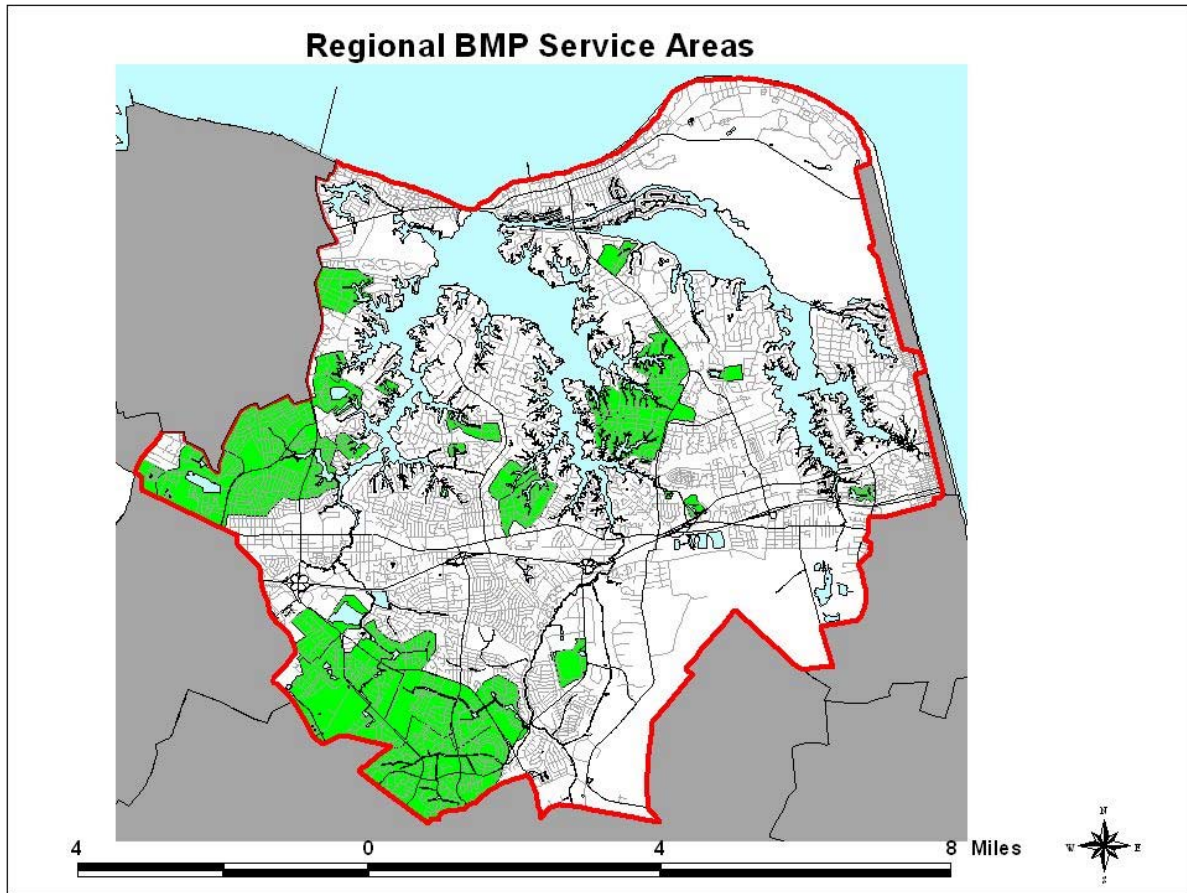


Figure 22

## 5.8 Protected Species

### 5.8.1 Listed Species

Listed species are those plant and animal species that have been recognized as either endangered or threatened by the United States Fish and Wildlife Service as well as those listed as endangered, threatened, rare or unusual by the State of Virginia. A species can be considered a species of concern and this requires additional information to decide if they should require more protection. A basis for the federal listing of species falls under the following factors (Nicholopoulos, Joy):

- The present or threatened destruction, modification, or curtailment of the species' habitat or range;

Draft

- Overutilization for commercial, recreational, scientific, or educational purposes;
- Disease or predation;
- The inadequacy of existing regulatory mechanisms; and
- Other natural or manmade factors affecting the species' continued existence.

The Virginia Natural Heritage program within the Department of Conservation and Natural Resource maintains a database with information on protected species in Virginia, including information on both federal and state protected species and state species of concern. They have it listed by subwatershed and the data is summarized in the following table.

Scientific Name	Common Name	<a href="#">State Rank</a>	<a href="#">Federal Status</a>	<a href="#">State Status</a>	Num Occurrences Statewide
<b>C08 - LYNNHAVEN RIVER/LITTLE CREEK</b>					
ARACHNIDA (SPIDERS & PSEUDOSCORPIONS)					
<a href="#">Barronopsis jeffersi</a>	A Funnel-web Spider	S1S3			1
<a href="#">Castianeira trilineata</a>	A Two-clawed Hunting Spider	S1S3			1
<a href="#">Drassylus louisianus</a>	A Gnaphosid Spider	S1S3			1
<a href="#">Pisaurina dubia</a>	A Nursery-web Spider	S1S3			1
BIRDS					
<a href="#">Haliaeetus leucocephalus</a>	Bald Eagle	S2S3B,S3N	LT	LT	576
<a href="#">Nyctanassa violacea</a>	Yellow-crowned Night-heron	S2B,S3N		SC	6
<a href="#">Sterna antillarum</a>	Least Tern	S2B		SC	22
COLEOPTERA (BEETLES)					
<a href="#">Pseudaptinus lecontei</a>	A Ground Beetle	S1S3			1
COMMUNITIES					
Natural Community	Interdune Pond	SNR			11
Natural Community	Maritime Dune Grassland	SNR			7
Natural Community	Maritime Dune Scrub	SNR			10
Natural Community	Maritime Dune Woodland	SNR			8
Natural Community	Maritime Swamp Forest	SNR			3
Natural Community	Maritime Upland Forest	SNR			9
HETEROPTERA (TRUE BUGS)					
<a href="#">Bothynotus johnstoni</a>	A Mirid Bug	S1S3			1

Draft

Draft

<a href="#"><i>Ctenotrachelus shermani</i></a>	Combneck Assassin Bug	S1S3			1
<a href="#"><i>Melanaethus cavicollis</i></a>	A Burrower Bug	S1S3			1
<a href="#"><i>Ploiaria carolina</i></a>	Carolina Thread-legged Bug	S1S3			1
<a href="#"><i>Ploiaria hirticornis</i></a>	An Assassin Bug	S1S3			2
<a href="#"><i>Pnirontis brimleyi</i></a>	Brimley's Assassin Bug	S1S3	SOC		1
<a href="#"><i>Pynoderiella virginiana</i></a>	Seashore Mirid Bug	SU			1
LEPIDOPTERA (BUTTERFLIES & MOTHS)					
<a href="#"><i>Calephelis virginiensis</i></a>	Little Metalmark	SH			6
<a href="#"><i>Papaipema sp. 3</i></a>	Southeastern Cane Borer Moth	S2S3			3
<a href="#"><i>Satyrium kingi</i></a>	King's Hairstreak	S2S3			3
MAMMALS					
<a href="#"><i>Corynorhinus rafinesquii macrotis</i></a>	Eastern Big-eared Bat	S2		LE	28
NON-VASCULAR PLANTS					
<a href="#"><i>Sphagnum molle</i></a>	Soft Peatmoss	S2			3
<a href="#"><i>Somatochlora filosa</i></a>	Fine-lined Emerald	S2			7
REPTILES					
<a href="#"><i>Deirochelys reticularia</i></a>	Chicken Turtle	S1		LE	2
VASCULAR PLANTS					
<a href="#"><i>Arenaria lanuginosa ssp. lanuginosa</i></a>	A Sandwort	SH			1
<a href="#"><i>Chamaesyce bombensis</i></a>	Southern Beach Spurge	S2			15
<a href="#"><i>Cirsium repandum</i></a>	Coastal-plain Thistle	SH			2
<a href="#"><i>Desmodium strictum</i></a>	Pineland Tick-trefoil	S2			16
<a href="#"><i>Eleocharis baldwinii</i></a>	Baldwin Spikerush	S1			8
<a href="#"><i>Eleocharis vivipara</i></a>	Viviparous Spikerush	S1			5
<a href="#"><i>Honckenya peploides ssp. robusta</i></a>	Sea-beach Sandwort	SH			1
<a href="#"><i>Hydrocotyle bonariensis</i></a>	Coastal-plain Penny-wort	S1?			4
<a href="#"><i>Iva imbricata</i></a>	Sea-coast Marsh-elder	S1S2			8
<a href="#"><i>Lipocarpa maculata</i></a>	A Lipocarpa	S1			4
<a href="#"><i>Ludwigia brevipes</i></a>	Long Beach Seedbox	S2			18
<a href="#"><i>Osmanthus americanus var. americanus</i></a>	Wild Olive	S1			4
<a href="#"><i>Physalis walteri</i></a>	Sticky Ground-cherry	S2			12
<a href="#"><i>Pinus palustris</i></a>	Long-leaf Pine	S1			9
<a href="#"><i>Quercus hemisphaerica</i></a>	Darlington's Oak	S1			5
<a href="#"><i>Quercus incana</i></a>	Blue Jack Oak	S2			16
<a href="#"><i>Quercus laevis</i></a>	Turkey Oak	S2			14
<a href="#"><i>Rhynchospora fascicularis var. fascicularis</i></a>	Fasciculate Beakrush	S1?			11
<a href="#"><i>Rhynchospora scirpoides</i></a>	Long-beaked Baldrush	S1			5
<a href="#"><i>Solidago tortifolia</i></a>	A Goldenrod	S1			7
<a href="#"><i>Sparganium androcladum</i></a>	Branching Burreed	SH			1

Draft



Draft

<a href="#"><i>Spartina pectinata</i></a>	Freshwater Cordgrass	S2			17
<a href="#"><i>Stipulicida setacea</i> var. <i>setacea</i></a>	Pineland Scaly-pink	S1			4
<a href="#"><i>Utricularia purpurea</i></a>	Purple Bladderwort	S2			10
<a href="#"><i>Wisteria frutescens</i></a>	American Wisteria	S2			7

The division of Natural Heritage used the standard abbreviations for Federal endangerment developed by the U.S. Fish and Wildlife Service, Division of Endangered Species and Habitat Conservation.

- LE** Listed Endangered- threatened with extinction throughout all or a significant portion of its range
- LT** Listed Threatened – likely to become endangered in the foreseeable future
- PE** Proposed Endangered
- PT** Proposed Threatened
- C** Candidate – enough information is available to propose for listing, but listing is pending due to proposals of higher priority
- SOC** Species of Concern – species that merit special concern
- NF** No federal legal status

The Division of Natural Heritage uses similar abbreviations for State endangerment.

- LE** Listed Endangered
- LT** Listed Threatened
- C** Candidate
- SC** Special Concern
- NS** No state legal status
- PE** Proposed Endangered
- PT** Proposed Threatened

The Natural Heritage or state ranks are used by the Virginia Department of Conservation and Recreation to set protection priorities for natural heritage resources, or “NHR’s” are rare plant and animal species, rare and exemplary natural communities, and significant geologic features. The primary criterion for ranking NHR’s is the number of populations or occurrences. Also of great importance is the number of individuals in existence at each locality or if highly mobile the total number of individuals.

- S1** Extremely rare; usually 5 or fewer populations or occurrences in the state; vulnerable to extirpation
- S2** Very rare; usually between 5 and 20 populations or occurrences; often susceptible to becoming extirpated.
- S3** Rare to uncommon; usually between 20 and 100 populations or occurrences; may be susceptible to immediate threats.
- S4** Common; usually greater than 100 populations or occurrences; may be restricted to only a portion of the state; usually not susceptible to immediate threats.

Draft

Draft

- S5** Very common; demonstrably secure under present conditions
  - SA** Accidental in the state
  - S#B** Breeding status of an organism with the state
  - SH** Historically known from the state, but not verified for an extended period, usually more than 15 years
  - S#N** Non-breeding status within the state; usually applied to winter resident species
  - SU** Status uncertain, often because of low search effort or cryptic nature of the element
  - SX** Apparently extirpated from the state
  - SZ** Long distance migrant, whose occurrences during migration are too irregular, transitory and/or dispersed to be reliably identified, mapped and protected
- (“Definitions of Abbreviations...”)

### **5.8.2 Designated Critical Habitat**

For all Federally listed species the U.S. Fish and Wildlife Service has the ability to designate critical habitat, thereby providing protection for the habitat as well as the species itself. The Endangered Species Act states that the areas that are designated as critical habitat must be protected from degradation. There is currently no critical habitat designated within the Lynnhaven Watershed for any federally listed species at this time. The only species that could be considered for this are the bald eagle and the loggerhead turtle. The loggerhead turtle is on the Atlantic side of the Watershed and is not in the Watershed per se, as well, the bald eagle is a species that’s location cannot be determined in its entirety to deem its habitat of critical designation. If the status of listed species changes in the Lynnhaven Watershed both the FWS and the City of Virginia Beach will research and determine locations that need to be designated as critical habitat in order to protect the species and their homes from further damage.

### **5.8.3 Habitat Conservation Plans**

After the passage of the Endangered Species Act there came the concern of certain species on non-federal landowners property and their well-being. This concern gave the U.S. Fish and Wildlife Service the motivation to create Habitat Conservation Plans or HCP’s. This is an agreement between a landowner and the FWS that allows incidental take of a threatened or endangered species in the course of otherwise lawful activities, when the landowner agrees to conservation measures to minimize and mitigate the impact of the taking. For example, the international paper company developed an HCP covering the red-cockaded woodpecker on company lands in the southeast. This HCP describes the impact of timber operations on the red-cockaded woodpecker and measures to mitigate that impact. Such measures include actively managing approximately 5,300 acres of habitat in order to increase the population on that habitat to 25-30 clusters (Nelson, Marj). The HCP process contains “No Surprises” assurance. This specifies that the Services will not require additional commitments or restrictions beyond those originally specified in the HCP. In hopes, this will encourage the private sector to develop long-term conservation plans and will attempt to resolve conflicts through negotiation and compromise rather than continued litigation. This process will help us create innovative

Draft

Draft

strategies that enrich species conservation and minimize impact to habitats and water quality while allowing for economic development.

The Lynnhaven watershed currently does not have any HCP's within its' boundaries. However the Bald Eagle and the Loggerhead Sea Turtle are listed species in The City of Virginia Beach. The Bald Eagle is very transient making it difficult to minimize impact in the watershed. The Watershed is fairly built out thus making it difficult to mitigate elsewhere in its' boundaries. As well, the Loggerhead turtle is apparent in the Atlantic but rarely found in the waters of the Lynnhaven making an HCP unnecessary at this time. It is proposed that in the future when aquatic plant and animal species become of concern that an HCP will be considered as a means to mitigate and lessen the impact of continual development and redevelopment.

## **5.9 Water Quality Modeling Approach and Methodology**

### **5.9.1 Existing Conditions**

### **5.10 Existing Management Programs and Watershed Planning Efforts**

A wide variety of agencies have an interest in the Lynnhaven Watershed and in improving water quality in the Lynnhaven. Through a variety of approaches, the common goal is to restore what has been lost and conserve existing resources. Agencies include government, non-profit, and grass roots volunteer organizations. Each organization has its own approach to improving water quality and gaining community involvement. The next section of this plan will look at each agency's programs.

#### **5.10.1 Oyster Heritage Program**

In 1999 The Virginia Coastal Program at the Department of Environmental Quality and the Virginia Marine Resources Commission initiated The Virginia Oyster Heritage Programs (VOHP) in hopes to restore oyster reefs and Virginia's native oyster. The program has grown into a partnership of state and federal agencies, non-profit organizations and local citizens whom are working to combine their resources and talents toward a large-scale oyster restoration effort. Many projects have been done around the Commonwealth with four distinct reefs restored in the Lynnhaven River with plans to establish more reefs. The reefs are located at Keeling Drain (est.1999), Great Neck Point (est.2000), Long Creek (est.2000) and Broad Bay (est.2000). (see map) Under the umbrella of the VOHP is both the construction of the sanctuary oyster reefs and monitoring of the reefs' productivity and health. VMRC staff conducts dive surveys and take samples to determine the health, age, and quantity of oysters on the reef, as well as determining the reefs success in improving water clarity and biodiversity. The educational component teaches the public about the benefit of oysters being brought back into the Lynnhaven. Educational materials are on display in the Virginia Marine Science Museum in Virginia Beach as well as on their web site. Volunteers help in construction projects, education and with material donations and funding. Funding for this program comes from NOAA funds, grants, matching funds raised through donations, and in Virginia Beach, additional funding comes from mitigation funds paid by citizens granted a variance to do construction on their property located

Draft

### **5.10.2 CBPA Program**

Increasing awareness of the decline of the Chesapeake Bay started the first Chesapeake Bay Agreement in 1983. There was cause for concern on both an economical and environmental level. The agreement includes Virginia, Maryland, Pennsylvania, the District of Columbia, the EPA and the Chesapeake Bay Commission, who agreed to commit their time and resources to improve water quality and reduce both point and non-point source pollution. The Virginia general assembly adopted the Chesapeake Bay Preservation Act in 1988 and required all localities in Tidewater Virginia to implement local water quality measures by utilizing and developing land in ways that minimize impacts on water quality. Virginia Beach responded to this requirement by adopting the Chesapeake Bay Preservation Area Ordinance in January of 1991. The CBPAO affects all properties that drain to the Chesapeake Bay in the City; the majority of which is the Lynnhaven Watershed. The purpose of the CBPAO is to protect existing high quality waters, prevent an increase in pollution and to restore state waters to a condition that permits all reasonable public uses and supports the growth of healthy aquatic life. This is accomplished by regulating development practices in the watershed. The most highly regulated areas are buffers called Resource Protection Areas. RPAs include tidal wetlands, non-tidal wetlands, tidal shores, highly erodible soils, and a variable width buffer area not less than one hundred feet in width that is adjacent to and landward of these areas. Buffer areas are also located along both sides of any water body with recurrent flow. All of the other land in the watershed is labeled as Resource Management Areas, and protects the boundaries of the RPA. Both RPAs and RMAs are shown on the Chesapeake Bay Preservation Area Maps. (Example Map) The program is constantly dealing with the problems that come along with development and managing growth, improving Bay water quality and improving the overall quality of life.

Another aspect of the CBPAO is addressing the problem of non-point source pollution. Non-point source pollution is a term that describes a variety of contaminants and pollutants that do not come from a specific source, but rather wash into waterways in a diffuse manner. The CBPAO focuses on the problem by encouraging the redesign of new development projects to limit NPS pollution as well as enforcing the implementation of Best Management Practices (BMP's) to reduce its detrimental effects. BMPs reduce the quantity and improve the quality of stormwater runoff through structural, behavioral, and vegetative methods. Another step in the fight against NPS is educating the public. Citizens in the Lynnhaven Watershed can drastically make a difference by using alternatives to pesticides, fertilizing lawns sparingly, maintaining septic systems, reducing runoff from property by having less impervious cover, caring for cars and managing pet waste.

### **5.10.3 Erosion and Sediment Control Program**

Draft

Erosion is a natural process, but humans have the potential to speed up the process to the point it becomes damaging to our ecosystem. Sediment is a valuable resource when it is on land but it is quite the opposite in our waterways. When large amounts enter our streams and rivers it can cause major problems. Sediment, when suspended, dramatically reduces light penetration in our streams and rivers resulting in very low aquatic plant growth as well as carrying an overload of nutrients to our waters causing algal overgrowth also limiting sunlight. Virginia Beach's main generator of sediment pollution is from our construction sites and over development. A typical construction site erodes at a rate of up to 100,000 tons per square mile per year. This rate is 200 times greater than erosion from cropland and 2000 times greater than erosion from woodland (DCR 1992).

When implemented properly, erosion and sediment control measures can control soil movement as to provide minimal loss. This type of control will also assume no appreciable damage to off-site receiving channels, will enhance project aesthetics before, during and after development, and result in fewer complaints from concerned government agencies and citizens. Virginia's Department of Conservation and Recreation has created the Virginia Erosion and Sediment Control Handbook in order to establish minimum design and implementation standards to control erosion and sedimentation from land-disturbing activities in Virginia. The handbook has been updated several times since it's beginning in 1974, and now focuses on E&S measures, engineering methods, law and regulation changes and stresses proper program implementation to enhance state and local attempts to mitigate sediment loss as a result of urban construction.

In the City of Virginia Beach, all construction must conform to the minimum standards of The Virginia Erosion and Sediment Control Regulations and the Virginia Erosion and Sediment Control Handbook third edition. When an erosion and sediment control plan is submitted for review and approval, it must include the following:

- 1) Existing topography
  - 2) A narrative, discussing problems and solutions for the site
  - 3) A site development plan "outline or footprint"
  - 4) Calculations used
  - 5) Erosion and sediment control measures to be used
- (City of Virginia Beach, Standards and Specifications)

All construction related activities are to limit land disturbance to the amount necessary to accommodate the desired improvements. Work will be avoided in the tree drip line area and comply with the Virginia Erosion and Sediment Control Handbook with respect to tree preservation and protection and all contractors must have the current edition of the Virginia Erosion and Sediment Control Handbook available on-site. (Public Works Specifications and Standards)

The City of Virginia Beach also requires that all development projects disturbing 2,500 square feet or more of land must submit an Erosion & Sediment approval and post a \$500 per acre surety, with the exception of individual single family site plans. Once the E&S control plan is approved and the surety is posted, a permit is issued for the land disturbing activity. The permit

Draft

Draft

and inspections fees are collected by the Department Services Center at the time the permit is issued.

#### **5.10.4 Wetlands and Waterfront Operations Program**

The Waterfront Operations Bureau is part of the City's Planning Department. Their main focus is preventing the despoliation of wetlands, sand dunes and lowland resources on the coastline of the Chesapeake Bay and Atlantic Ocean and enforcing the decisions of the Wetlands Board. They concentrate the rest of their time on regulating residential and commercial waterfront construction. Individuals submit a joint permit application to the Virginia Marine Resource Commission who passes it on to waterfront operations where it is reviewed to determine if it meets the criteria in the city's code. The criterion includes; that the construction does not encroach on the rights of others, it conforms to the area and that the construction follows accepted practices. Once these are determined, the application is prepared for permitting. Construction cannot be prevented entirely but with the discretion of the Waterfront Operations program it can be done in a less detrimental way so that wetlands and sand dunes are protected.

#### **5.10.5 HEC**

The Virginia Beach Agriculture department established The Habitat Enhancement Committee in 1992. Volunteers representing the business community, federal, state and local governments, conservation organizations, as well as the general public have created a partnership that is committed to enhancing Virginia Beach's natural environment through coastal sand dune stabilization, tidal wetland restoration, community tree plantings and a variety of other environmentally and aesthetically sound projects. Excluding administrative costs, HEC completes its projects without the use of direct tax dollars. It is funded by several sources, including: civil charges collected from violations to the City's Wetlands and Coastal Primary Sand Dune ordinances and violations against the Chesapeake Bay, donations by individuals and businesses as well as government and private grants.

HEC chooses projects that provide both economic and environmental benefits, such as reducing soil erosion, creating wildlife habitat, alleviating flooding, enhancing property values, reducing energy costs, and improving the overall quality of life for citizens of Virginia Beach. The Habitat Enhancement Committee's accomplishments include:

- Contributing to the improvement of our air and water quality
- Enhancing flood and erosion controls on public and private property
- Improving aesthetics throughout the City by planting suitable vegetation
- Restoring important lost ecological functions of wetlands and sand dunes
- Building bridges between business, government, and communities of Virginia Beach
- Increasing wildlife habitat opportunities in our parks, neighborhoods, waterways, and forests
- Promoting stewardship and public educational opportunities through "hands-on" habitat

Draft

enhancement

(“Habitat Enhancement Committee”...)

### **5.10.6 Stormwater Management Program**

In 1993, the City implemented a storm water management service fee for the purpose of maintaining and upgrading drainage systems within the City by addressing issues such as floodplain problems, improving drainage, and reducing pollutants in storm water runoff. Projects funded by this fee include the creation and cleaning of roadside ditches, pipe installations, street sweeping, spill clean-ups, and catch basin cleanings.

For single family and multi-family properties with four or less units, the fee is the same, 15.1 cents a day, or \$55.26 a year. This number is referred to as the Equivalent Residential Unit (ERU). For all other multifamily and nonresidential properties, calculating the amount of impervious cover on the property and dividing that number by the average amount of impervious cover on all residential properties will determine the fee. The resulting number determines the amount of ERUs that the property owner will be billed for.

Virginia Beach’s National Pollutant Discharge Elimination System (NPDES) permit (also known as the Municipal Separate Storm Sewer System or MS4) designates that stormwater pollutants shall be reduced to the “maximum extent practicable.”

Recommendations for new development:

- Have DSC personnel encourage LID to developers

Point Source Discharges:

There are two agencies other than the City in the Lynnhaven Watershed that have NPDES permits to discharge waste water into waterways, Ft. Story Army Base, and Titan Ready Mix, which is a concrete company.

### **Environmental crimes division:**

The environmental crimes division deals with the improper disposal of items such as construction debris, hazardous materials, or hazardous waste. Virginia Beach maintains an environmental crimes hotline that citizens can call to report illegal disposals.

### **Hazmat:**

Virginia Beach's Hazmat team is a part of the City's Fire Department. The Hazmat team responds to situations involving materials emergencies, spills, releases, or accidents. The team is trained in OSHA and industry standards to clean up any hazardous materials spills and prevent them from contaminating the environment and causing danger or health problems to human life.

Draft



## **Street sweeping**

The Department of Public Works has a street sweeping program that has been in the works for nearly three years. The City has five street sweepers that concentrate their time on large arterials in the City on a regular cycle averaging every 2-3 months as well as high volume areas such as the oceanfront on a seasonal basis. There is one sweeper committed to focus on residential areas. Due to limited resources, residential areas that are swept tend to fall into one of three categories. When a neighborhood is looking to do a large clean up as a community the City will help them by picking up large debris placed in front of residents yards as well as street sweeping to rid the neighborhood of unwanted organics. Residential areas that have a history of high volumes of debris in the storm system due to dense vegetation are frequented by street sweepers as well as neighborhoods that the City or Police see as a neighborhood that risks declining in value where street sweeping can be used to upgrade the area aesthetically. Public Works has recently completed a study to discover there are 485 curb miles of residential streets in the Lynnhaven Watershed that do not include large City arterials or miles within BMP-subwatersheds. This information will aid in the creation of a plan to sweep all 485 miles. Based upon the residential street curb mileage and the one sweeper available for the program they have projected a bi-annual cycle along with the continuation of sweeping the large arterials on a regular cycle. The sweepers that the City owns are broom sweepers and focus on direct collection of organic materials and sediment, they are not regenerative air sweepers which clean to a more detailed level by clearing cracks in the street of heavy metals, phosphates and other pollutants. Within the next few years we will be able to more accurately conclude on the cubic volume that is collected and the most efficient frequency of sweeping to keep foreign debris and sediment from entering our waterways.

### **5.10.7 Public Utilities/Sewer hookups**

Little Neck Point is the largest concentration of septic systems still left in Virginia Beach. They are in the process of being transferred to gravity sewer. Each residence will have one year to connect once the gravity system is in place. It is estimated that the entire point will be finished by May 2005, so by May 2006, the entire peninsula will be on City sewer lines.

As other neighborhoods show interest in being hooked up to city sewer they will be put on a priority list. 51% of residents living in the area must show interest in becoming part of City sewer. Once this occurs the neighborhoods will be prioritized and figured into the CIP.

If a neighborhood does not show interest in being hooked up to city sewer but the health dept sees their septic as a violation they will automatically be a priority for the CIP budget without the 51% consent of residents living there.

The 150-200 individuals in the city who are not currently hooked up to city sewer are being investigated; some are connected with no account and some haven't made the connection yet. If a resident has been obtaining the benefits of having City sewer and does not have an account

Draft

with the City they will be back-charged a maximum of three years. If a house is near a gravity sewer system and their house is capable in doing so it is mandatory that they be connected. The only time a residency is not mandated to hook up to a gravity system that is nearby is if the relief between their home and the street is not enough and a pump system would be required to eliminate their septic tank. In this case the homeowner can determine if they want to be hooked to the city sewer or not. They are required to foot the bill of the pump installation but would get a price cut on connection fees.

#### **5.10.8 Illicit Discharges Program**

The EPA's Clean Water Act established the National Pollutant Discharge Elimination System, otherwise known as the NPDES program. This requires permits for discharges from municipal storm sewers into waters of the United States. These regulations require the City of Virginia Beach to control the contribution of pollutants to municipal storm sewers by stormwater discharges associated with industrial activity and the quality of stormwater discharged from sites of industrial activity by the means of ordinance, permitting, contracting or similar means. Illicit discharges to municipal storm sewers are prohibited and discharges that make their way to municipal storm sewers via spills, dumping or disposal of materials other than stormwater must be controlled through the City Ordinance. It is necessary to carry out inspections, surveillance, and monitoring procedures necessary to determine compliance and noncompliance with permit conditions. The City of Virginia Beach has partaken in illicit discharge education by storm drain stenciling to publicize the effects as well as providing visual screening at outfalls during dry weather to locate priority areas of pollutant discharge.

#### **5.10.9 Marine Patrol Program**

The Law Enforcement division in the Virginia Marine Resources Commission encompasses about half of the commission's entire employment. Virginia Marine Police perform a variety of services including inspection of harvest methods, and condemned seafood harvesting areas, sale of commercial licenses, environmental enforcement and when posted no wake zone enforcement. There are enforcers located in the Lynnhaven Watershed in Linkhorn Bay, Broad Bay, East and West Lynnhaven and their tributaries. When on patrol the Marine Police are looking for any suspicious activities such as point source discharge from watercrafts, and anything else out of the norm that has the potential to harm the ecosystem. In many cases when there is reason to believe something detrimental is being done they will report it to either the Department of Environmental Quality or to the locality, for further investigation. The Virginia Marine Police work hard to not only keep the Lynnhaven Watershed safe but also clean for the community.

#### **5.10.10 Clean Community Commission**

The Virginia Beach Clean Community Commission (VBCCC) is a Mayor- appointed group formed in 1980 to promote litter prevention, recycling, beautification and general environmental projects for the betterment of the community. The Commission is composed of volunteers who

Draft

Draft

are assigned to a variety of operational committees, including business, education, finance and fundraising, public relations, recognition, special events, and supporting organizations. These committees educate the public, businesses, and develop projects to enhance the community. A few of their large projects have been very popular, drumming support from thousands of volunteers. Clean the Bay Day, part of a Bay-wide effort spearheaded by the Chesapeake Bay Foundation, was initiated in 1989. The basis for this project is not only to clean up beaches and shorelines of the Chesapeake Bay and its tributaries with the help of the community but also to quantify and document the types of litter found. The resulting data is used to help identify and support policies and practices that address the disposal of waste. While achieving this, many of the volunteers are educated in litter prevention and obtain a sense of stewardship to their environment and community. Another event is the annual Earth Day celebration held in Hampton roads. At Earth Day, VBCCC educates the community through exhibits, games, crafts and displays. The VBCCC also has community outreach programs such as the “Adopt a” program where individuals or groups can adopt a piece of land, waterway, or stretch of road and are responsible for keeping it litter-free and clean. Storm drain stenciling was implemented to help increase public awareness of the environmental effects of dumping waste such as cigarette butts and oil into the storm drains, leading to pollution in area waterways. The VBCCC also recognizes businesses that strive to maintain their property and keep it litter-free with a Litter Free Award. Finally, an annual recognition of all volunteers is held with an Environmental Service Recognition Breakfast.

## **5.11 Regulatory and Non-Regulatory Drivers**

There are a myriad of regulatory and non-regulatory drivers that combine their time, resources and expertise in conservation efforts for the Lynnhaven watershed. Regulatory drivers include any government agency, federal, state, or local, that has had a hand in shaping the rules and regulations that protect the watershed. Many divisions within the regulatory sector also focus their efforts towards education, restoration and technical aid. The non-regulatory drivers have mostly taken the stance as advocates and stewards of the waters. These organizations, whether private or non-profit, aim to educate the community about issues facing the Lynnhaven Watershed. They are also responsible for many of the restoration projects and technical aid provided in the watershed. All of these combining efforts are working for a common goal, a cleaner watershed, and a healthier ecosystem.

### **5.11.1 Federal Programs**

#### **5.11.1.1 Environmental Protection Agency and the Chesapeake Bay Program**

Within the Environmental Protection Agency is the Chesapeake Bay Program, America’s premier watershed restoration partnership. The Chesapeake Bay Program is the unique regional partnership that has been directing and conducting the restoration of the Chesapeake Bay since the signing of the historic Chesapeake Bay Agreement of 1983. The Bay Program partners include, the Chesapeake Bay Commission, Commonwealth of Pennsylvania, Commonwealth of Virginia, District of Columbia, State of Maryland, and the U.S. Environmental Protection Agency. On June 28, 2000, the Chesapeake Bay Program partners signed the new Chesapeake

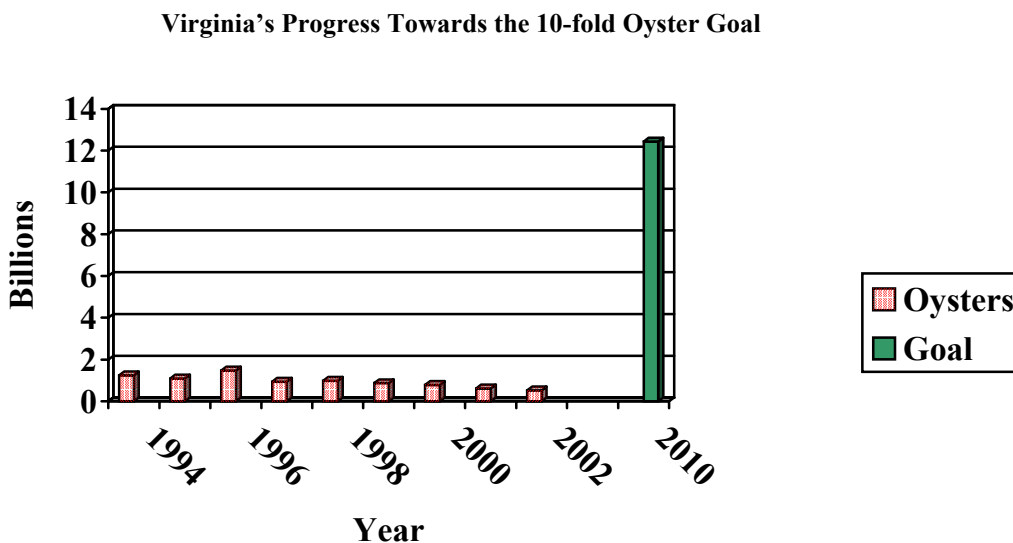
Draft

Draft

2000 Agreement, which is to guide the next decade of restoration and protection efforts throughout the Bay watershed. The Chesapeake Bay Program's focus is not only to restore and protect living resources and vital habitats of the bay, but also to protect the health of the human population that depends on the Bay (Fritz, Mike). Improvements include fisheries and habitat restoration, recovery of Bay grasses, nutrient and toxic reductions, and significant advances in estuarine science.

In order to encourage local programs to improve their water quality and restore important habitats within the Chesapeake Bay, the Bay Program Partners showed their support in developing and implementing watershed management plans by granting 1.5 million dollars to 59 community-led organizations and local governments across the Bay Watershed. The City of Virginia Beach is one of the recipients of the small watershed grants and its funding is what has made the Lynnhaven Watershed Management Plan possible.

Many of the restoration and preservation objectives are bay-wide and translated into site-specific focus by the partner states. The Bay wide oyster restoration program named the Lynnhaven River as one of the inclusion areas in this project. The goal by the year 2000 was to designate approximately 5,000 acres of oysters each in MD and VA and 1,000 acres in the Potomac, and to create new oyster reef habitat within these areas. They ended up designating over 50,000 acres and constructing 330 acres by 2001. (waiting for new info) See following chart.



The Chesapeake Bay Program is involved throughout the Bay with many projects to help restore our unique ecosystem. They have their hand in everything from SAV and oysters to fisheries and waterfowl populations. All of these projects help in the Bay Program's commitment to protecting and restoring the living resources, vital habitats and water quality of the Bay and the multitude of subwatersheds that contribute to it.

Draft

### **5.11.1.2 Army Corps of Engineers**

Close to 34,600 civilian and 650 military personnel make up the U.S. Army Corp of Engineers. The Corps employs engineers, biologists, hydrologists, geologists, natural resource managers and many other specialists that work as leaders in engineering and environmental matters. Their mission is to provide quality, responsive engineering services to the nation. They are involved in planning, designing, building and operating water resources and other civil works projects, designing and constructing military facilities and providing design and construction management support for other defense and federal agencies. A large portion of the Corps work is dedicated to research and studies for non-D.O.D. Federal agencies, States and local governments under the Interagency and International Support program. The U.S. Army Corps of Engineers is currently engaged in several projects with the City of Virginia Beach and has joined their efforts in restoring the Lynnhaven Watershed. The Lynnhaven River Environmental Restoration Project was initiated in 2002. The purpose of this study is to determine whether planning for the improvement of water quality, environmental restoration and protection, and related purposes for the Lynnhaven River, Virginia, should proceed further. This decision will be based on a preliminary appraisal of the Federal interest and of the consistency of potential solutions with current policies and budgetary priorities. The Corps has noticed increased sedimentation, degraded water quality, 50% loss of wetlands in the last 30 years, loss of SAV, and nearly 100% loss of oyster production in the last 70 years. With many of these issues devastating the Lynnhaven, the Corps saw this as an opportunity to turn things around, with water quality improvements focusing on stormwater runoff, fecal coliform pollution and a lower dissolved oxygen count, thus leading to potential stormwater retrofit sites. There are a profusion of restoration opportunities, including, wetlands, riparian buffers, SAV and oyster reefs, as well as contaminated sediment removal.

There is another project that is in the planning phase dealing with oyster restoration. The Lynnhaven River is home to a multitude of private oyster leases. However at the current state of the river they are not prospering. The Corp and Lynnhaven River 2007 are exploring the possibility of obtaining a portion of the private leases. These would be stocked with the native Virginia oyster and in time, produce a thriving population as there once was. The portion of the lease that was given to the project would become an oyster sanctuary and harvesting would be prohibited. Having parent oysters in the sanctuary would assure that adjacent reefs would repopulate as well leaving oysters for generations to come. With a surplus of oysters in the water, their natural filtering system would increase the water clarity exponentially. This would be conducive to a healthy ecosystem and allow other natural process to happen, such as SAV growth and abundant marine life.

### **5.11.2 State Programs**

#### **5.11.2.1 Alliance for the Chesapeake Bay**

The Alliance for the Chesapeake Bay is a regional non-profit organization that builds and fosters partnerships to restore the bay and its rivers. They were founded in 1971 and are funded by individuals, corporations, governments and foundations. The Alliance places a great deal of

Draft

effort on training the citizens in the community on environmental and conservation issues. They develop methods and tools for restoration activities and provide training on how to use them, mobilize decision makers, stakeholders and other citizens to learn about Bay issues and participate in resolving them. They also provide analyses and evaluation of Bay policies, proposals and institutions (Dowling, Kate). ACB assists citizen volunteers in many localities by providing technical support for water quality monitoring within the community watersheds.

The Alliance organizes their programs and projects into four categories. The Watershed Protection and Partnerships program area incorporates projects that teach or promote sustainable practices for how to live, work and play in the Bay Watershed. Projects involve training on watershed protection to individuals, businesses and local governments. It incorporates volunteers in planning and implementing local activities, as well as maintaining a strong partnership component. Just a few of the projects that fall under this program area are ACB's Bay and River Sojourns (educational paddling trips), Bayscapes (environmentally friendly landscaping) and RestoreCorps (a comprehensive training and volunteer recruitment program aimed at accelerating on-the-ground conservation measures).

The Restoration and Monitoring program area are projects that involve on-the-ground restoration and monitoring activities. Citizen water quality monitoring, (weekly tests), estuarine habitat, stream, and forest buffer restoration, are several programs that focus on innovative techniques as well as citizen involvement.

Communication and Information projects present balanced, objective, and in-depth information on issues central to the restoration of the Chesapeake Bay Watershed. This program area publishes the Bay Journal, an informative journal to educate the public on issues and events facing the Bay Watershed. The Chesapeake Bay Naturally Calendar portrays the beauty of the Area and profits generated from its sale benefit ACB. There is also a black tie benefit called the Taste of the Chesapeake that generates revenue for ACB as well as honors the work of one of the region's leading Bay advocacy organizations. This benefit provides an opportunity for individuals to taste culinary specialties from the area's premier chefs.

The Public Policy program area focuses on building a consensus; this is a critical tool for protecting and restoring the Bay and its rivers. To successfully meet their restoration goals, support is needed from a diverse range of people whose choices and actions affect the ecosystem. Some of their consensus-building work includes the Chesapeake Bay Renewal Project, which helped develop a consensus on issues that needed to be addressed in the 2000 Bay Agreement as well as the Citizen Advisory Committee that provides advice and guidance to the Executive Council as needed implementing the Chesapeake 2000 Agreement.

The combined efforts of each of the ACB's program areas cover a variety of conservation efforts and advocacy for The Bay. Their focus is on the Chesapeake Bay in its entirety but when it comes to the Lynnhaven Watershed specifically they have been eager to help. There are currently citizen-monitoring programs being done in the Lynnhaven waters and most of their other programs are applicable to our community as well.

Draft

### **5.11.2.2 Chesapeake Bay Foundation**

The Chesapeake Bay Foundation is the largest and oldest conservation organization working to “save the bay” in the Chesapeake Bay Watershed. With offices in Maryland, Virginia, Pennsylvania and Washington D.C., the foundation's focus is to reduce pollution, improve fisheries and protect and restore natural resources. Established in 1967, CBF is a non-profit organization with 95% of its funding privately raised.

CBF works in three specific areas to protect and restore the Bay. Those areas are Environmental Education, Environmental Protection (Advocacy), and Restoration. For students and their teachers, CBF has two educational programs that service the Hampton Roads area. One program is CBF’s 42-foot deadrise vessel, *Baywatcher*, and the second program is the Virginia Canoe Rig. In addition to studying the effects that this southernmost Bay port has on the watershed, students explore the Lynnhaven River (or another river) and learn about the relationship between the land and the water aboard either of these vessels. There is also a restoration component (for shad, underwater grasses, and/or oysters) applicable to students and their teachers in certain cases. There are also five residential centers up and down the Bay that Virginia Beach students and teachers can and have visited. For teachers, CBF has two programs that help instill Bay understanding in the classroom. Those programs are the W.A.V.E. (Watershed Action for Virginia’s Environment) Curriculum and the Chesapeake Classrooms Program. Through Chesapeake Classrooms, CBF provides professional development and materials to interested teachers over one year to implement multi-week units focused on the local watershed environment. Chesapeake Classrooms help increase students' environmental literacy, stewardship, and engagement in the learning process. For adults (locally), CBF’s Hampton Roads office coordinates programs such as the “Green Breakfast” (with the help of the planning members), “Save the Bay Breakfast”, and a Speakers Bureau and Fairs and Festivals outreach program. These types of programs build stewardship and help create a knowledge base for area citizens to help care for local natural resources. CBF believes that in order to improve water quality of the Bay and its tributaries, it is necessary to educate and empower its citizens, teachers and students about Bay health. CBF staff (and its members and volunteers in come cases) protect the Bay's natural resources from pollution and other harmful activities by fighting for strong and effective laws and regulations, primarily on the state and local level. They work cooperatively with government, business, and citizens in partnerships when possible. When necessary, CBF uses legal means to force compliance with existing laws. Where sustainable, CBF restores the Bay's essential habitats and filtering mechanisms, such as forests, wetlands, underwater grasses, and oysters, through a variety of hands-on projects. Citizens and students participate in many of these activities (Everett, Christy).

### **5.11.2.3 Chesapeake Bay Local Assistance Department**

The Chesapeake Bay Local Assistance Department (CBLAD), an executive agency of the Commonwealth of Virginia under the Natural Resources Secretariat, was founded in 1988 with the passage of the Chesapeake Bay Preservation Act. The mission of CBLAD is “...to protect



Draft

the public interest in the Chesapeake Bay and other state waters by planning for and managing the adverse environmental effects of growth and development in a manner that balances the objectives of improved water quality and continued economic growth.” The Act and corresponding Regulations are implemented and enforced by the 84 counties, cities and incorporated towns of Tidewater Virginia through local ordinances and comprehensive plans.

The CBLAD has a staff of twenty, which include the Agency Director, Environmental Planners, Environmental Engineers, Special Projects Planners, and Administrative Staff. CBLAD employees have a variety of backgrounds and experience in Chesapeake Bay issues, watershed, community and economic development planning, and local government administration. The CBLAD assists localities with all aspects of administering their Local Bay Preservation Act Programs. Services include oversight, review of Local Programs and site plan reviews, providing training and regulatory guidance and administering grant funding. The Department has provided millions of dollars in grant funding to localities to support Local Bay Preservation Act Programs. The Department also performs local implementation reviews to provide additional feedback to localities on the implementation of their programs.

As required by the Chesapeake Bay Preservation Area Designation and Management Regulations local governments are required to adopt a local Chesapeake Bay Preservation Area Program. CBLAD has enforced this in Virginia Beach and assisted us in creating a program that covers the Lynnhaven Watershed. As required under the Regulations through the City’s program, the City has established Resource Protection Areas (RPA). The RPA includes a 100-foot buffer from any perennial waterbody, tidal wetland, tidal shore, and nontidal wetlands connected by surface flow to tidal wetlands or water body with perennial flow. In addition, the City of Virginia Beach has included highly erodible soils as a component of its RPA. Development is not allowed within the required 100 foot buffer unless the proposed activity is exempt under the regulations or is approved through a formal exception process established by the City in conformance with the Regulations (Link, Ryan).

#### **5.11.2.4 Department of Conservation and Recreation**

Virginia’s Department of Conservation and Recreation (DCR) is the state's lead nonpoint source pollution prevention agency. DCR’s voluntary and regulatory programs help protect and manage water and soil resources on a watershed basis across the Commonwealth. DCR works to give individuals, businesses, communities and all levels of governments the tools and information need to make wise decisions in conserving our natural and recreational resources. DCR does this by providing public and private interests with grants, financial incentives, planning, training, and technical expertise in a variety of areas including open space protection, land use and outdoor recreation, water quality improvement and agricultural and urban Best Management Practices implementation.

In a broad sense, DCR’s work falls into four categories. First, the department protects and provides access to the variety of landscapes that make up the commonwealth through its management of state parks and natural area preserves. More than 5 million visitors a year enjoy

Draft

Draft

brehtaking beauty and modern facilities in Virginia's State Parks. Natural area preserves protect significant natural resources while providing opportunities for hiking and nature observation.

Closely tied to land management, DCR identifies inventories and protects rare plants, animals and communities. Virginia is an ecological crossroads, rich in plant and animal species found few other places in the world. DCR's natural heritage database of these resources is the best in the state and also recognized as one of the best in the Western Hemisphere.

Likewise, the department protects and manages water and soil resources on a watershed-by-watershed basis across the commonwealth. Staff does so in programs for runoff pollution control and flood protection in both agricultural and urban areas. DCR uses financial incentives to farmers, nutrient management training, watershed-based unit planning, and supports the state's 46 soil and water conservation districts in protecting the state's waterways. These are voluntary programs providing clients with tools and information needed to make their own best decisions. Where DCR has regulatory power, such as dam safety, stormwater management and erosion and sediment control, they stress training and technical assistance in addition to compliance.

DCR also provides many public and private interests with grants, financial incentives, planning, training, and technical expertise in a variety of areas involving open space protection, land use and outdoor recreation. These areas include scenic rivers, scenic byways, greenways, park design, programs for local parks and recreation professionals and more. DCR is responsible for creating and updating the state's comprehensive outdoor recreation and open space planning document, the *Virginia Outdoors Plan*.

The agency also provides citizens with various stewardship opportunities through such initiatives as the Virginia Adopt-A-Stream program, roundtables and Small Watershed Management Planning. These programs and initiatives are meant to instill a sense of watershed ownership and help develop watersheds partnerships within communities throughout the commonwealth (Hill, Noah).

#### **5.11.2.5 Department of Environmental Quality**

The Department of Environmental Quality protects and enhances Virginia's environment for the well-being of all Virginians by planning and implementing a variety of environmental programs, and by resolving issues efficiently, openly, fairly and consistently. They are dedicated to protecting the environment and promoting the health of the citizens of the Commonwealth (Virginia Department). DEQ's air, water, and waste divisions administer state and federal environmental laws and regulations. One of these laws is the Federal Clean Water Act, which DEQ enforces along with other state laws to improve the quality of Virginia's streams, rivers, bays and ground water for aquatic life, human health and other water uses. Permits are issued to businesses, industries, local governments and individuals that take into account physical, chemical and biological standards for water quality.

Draft

Draft

DEQ's conservation efforts reach into the educational, restoration, technical, and good stewardship realms when it comes to the Lynnhaven Watershed. The Department of Environmental Quality is the owner of a program named Virginia Naturally, which plays a large role in educating the public on environmental issues and strives to link Virginians to environmental information. It promotes lifelong learning and stewardship to the commonwealth's natural resources. Virginia Naturally provides a gateway to statewide environmental education resources including information about volunteer opportunities, educational classes, community events, watershed maps and lesson plans. It links public and private groups together to reach more citizens and to provide a better understanding of scientific and economic challenges. With the many restoration challenges that face the Lynnhaven Watershed, DEQ has associated itself with the Virginia Oyster Heritage Program. This program has restored several reefs in branches of the Lynnhaven River and Broad Bay, which are currently reproducing oysters that are filtering sediment in the Bay. The Department of Environmental Quality aids the Lynnhaven Watershed with technical assistance by issuing environmental permits to limit the amount of pollution in our water and stormwater permitting. They are currently calculating the TMDLs (Total Maximum Daily Loads) for our region, which will give us better guidelines when it comes to enforcing the levels of toxins in our waters. DEQ's division of Pollution Prevention and Compliance Assistance provides free technical assistance and material to industry, governments, academia, non-profit and the public on how to prevent pollution. Their latest initiative encourages non-traditional approaches to responsible environmental stewardship that reward innovation and leadership. The DEQ strives to create good stewards in the community. They recognize businesses that are committed to implementing pollution prevention in their daily operations, called Businesses for the Bay, and are a voluntary team of forward-looking businesses, industries, government facilities and other organizations not only within the Chesapeake Bay at large, but also in the Lynnhaven Watershed. The businesses located in the Lynnhaven are:

The Department of Environmental Quality also extensively tests Virginia's rivers, lakes and tidal waters for pollutants. Over 130 different pollutants are monitored annually to determine whether the waters can be used for swimming, fishing, and drinking. The main pollutants affecting the Lynnhaven Watershed are suspended solids and fecal coliform.

#### **5.11.2.6 Virginia Marine Resources Commission**

Virginia's Marine Resources Commission continues to be a strong force working to protect the Chesapeake Bay and its inhabitants. Two important divisions within the VMCR are the Fisheries and Habitat Management Divisions. The Fisheries Management Division strives to provide long-term availability of Virginia's finfish and shellfish resources. By developing management plans for both commercial and recreational uses and by tracking fishery stock and its condition, this division provides an important monitoring system that helps with future growth. The fisheries management division also participates in all federal and local government organizations.

The Habitat Management Division conducts a permit program to preserve and protect subaqueous habitat, tidal wetlands and coastal primary sand dunes. These lands are vital in

Draft

Draft

keeping Virginia's water clean and for use as spawning and nursery areas for marine life. The Habitat Management Division also helps local areas oversee wetland programs.

The Conservation and Replenishment Department also operates under the direction of the VMRC. This department focuses on the management of Virginia's public oyster beds. The Conservation and Replenishment Department's restoration activities include the spreading of cultch as oyster settling substrate, dredging to bring back old oyster beds, oyster reef creation and the movement of oysters from seed to grow-out areas. All of these projects are monitored.

VMRC is also the hand behind the Virginia Marine Patrol program. They patrol the waters in the Lynnhaven Watershed, as well as other waterways in Virginia, providing inspections of harvest methods, the sale of commercial licenses, as well as enforcing illegal acts from point source pollution to the disregarding of no wake signs.

(ACOE oyster leases)

#### **5.11.2.7 Virginia Department of Game and Inland Fisheries**

Virginia's Department of Game and Inland Fisheries's mission is to manage Virginia's wildlife and inland fish and to maintain optimum populations of all species as well as serving the needs of the Commonwealth. They desire to provide the opportunity for all to enjoy wildlife, inland fishing, boating and related outdoor recreation and to promote safety for citizens and their property in connection with boating, hunting and fishing (VGDIF). The Department of Game and Inland Fisheries is also responsible for the "no wake" zones by placing water markers in the necessary areas to protect public safety and prevent erosion damage. In order for the citizens of the Commonwealth to enjoy the water on a recreational standpoint they have created a boaters guide with rules and regulations to keep not only them and their watercraft safe but to also keep the waterways clean and healthier. This handbook discusses environmental considerations such as not operating a personal watercraft in shallow water to prevent the stirring of bottom sediments and the destruction of aquatic vegetation, not docking your PWC in reeds or grasses that are fragile to the ecosystem, and precautions on fueling near water as to prevent spills. The handbook also discusses the proper discharge of oil, waste, trash and other hazardous substances in order to keep the waterways clean and prevent damage to the environment. It is illegal to dispose of these materials directly into the water and the Virginia Department of Game and Inland Fisheries are one of the state organizations to enforce and regulate it. A full copy of the handbook can be found at <http://www.boat-ed.com/va/handbook/index>.

#### **5.11.3 Local Programs**

##### **5.11.3.1 Hampton Roads Planning District Commission**

The Hampton Roads Planning District Commission is a regional organization representing sixteen local governments. They encourage and facilitate local government cooperation and state-local cooperation as well as serving as a resource of technical expertise to its member local governments. The HRPDC provides assistance on local and regional issues pertaining to

Draft

Draft

economics, physical and environmental planning and transportation. Part of their mission is to provide leadership and offer strategies and support services to other public and private, local and regional agencies in their efforts to improve the region's quality of life (Hampton Roads Planning). Several of HRPDC's studies and programs target our local watersheds. They support the non-profit organization Lynnhaven River 2007 as well as local studies that are being done for the Lynnhaven Watershed. HRPDC has a large focus on environmental education. Their special programs include HR WET (water conservation), HR CLEAN (litter control and recycling), and HR STORM (stormwater management). These programs include educational handouts, demonstrations and displays that combine their efforts to educate the community on environmental issues. The Hampton Roads Planning District Commission performs technical research and studies of waterways in the area as well as supporting local programs, comprehensive plan studies, shoreline, stormwater, and, water resources management and ground water analysis. HRPDC also awards well deserving youth educational mini-grants. These are to be put toward a project dealing with water conservation, stormwater management, pollution prevention, litter control or recycling. The Hampton Roads Planning District Commission encompasses a multitude of watersheds. Their endeavor in environmental planning, technical assistance, and environmental education are collaborative efforts toward a cleaner Hampton Roads and in turn, a cleaner Lynnhaven Watershed.

### **5.11.3.2 Hampton Roads Sanitation District**

The Hampton Roads Sanitation Department was created to help keep Virginia's waters clean by eradicating sewage pollution in the Chesapeake Bay's tidal waters. HRSD concentrates on providing quality wastewater treatment programs to protect and enhance the environment as well as protect the habitats of Virginia's native plants and animals. Not only does HRSD create effluent water to return to nature but the department is also involved in many other educational programs.

HRSD founded the Pollution Prevention Awards, which annually honor businesses and industries for efforts that focus on reducing waste at the source other than traditional treatment efforts. The Virginia Pilot-Ledger Star newspaper recognizes the award-winning businesses. Through this media coverage, the local community becomes more aware of how businesses are participating in the care of the environment. The HRSD is also involved in a boater education program to prevent boaters from dumping waste into Virginia waterways.

Earth Action Day is an event that provides environmental information, celebrations and activities for all ages during which the Hampton Roads Sanitation District takes this opportunity to help educate the public. HRSD professionals also offer time teaching laboratory analysis and giving tours of the treatment facilities.

HRSD also takes a financial role by presenting penalty fund environmental grants. These grants are given to those organizations whose projects benefit the receiving waterways or residents of HRSD and relate to environmental education or water quality improvements.

Draft

Draft

HRSD is a constant partner in making sure the Virginia waters, including the Lynnhaven Watershed, are becoming a safer resource for years to come.

### **5.11.3.3 Lynnhaven River 2007**

Local residents, Andrew Fine, Bob Stanton and Harry Lester founded the non-profit organization Lynnhaven River 2007 in 2003 when they became very concerned about the state of the Lynnhaven River. They remember a time when the Lynnhaven oyster was so abundant that harvesting was limited only by one's energy. That time is no more. Along with the overpopulation of the Lynnhaven area, came over development and environmental issues, inevitably resulting in an impaired watershed. What started with three men has now gained recognition and initiatives by the Commonwealth of Virginia, City of Virginia Beach, U.S. Army Corp of Engineers, and Chesapeake Bay Foundation. The organization's number one goal is a clean and healthy Lynnhaven River. Long term they want to see water quality improve substantially and to restore a native oyster that can be safely and legally consumed. As Lynnhaven River 2007 explains, "Oysters are a metaphor for clean water." They plan on carrying out their goals by identifying and reducing sources of contamination in the Lynnhaven, reducing nutrient, sediment and chemical runoff, and restoring lost habitats such as oyster reefs, salt marshes and other buffers that help filter polluted runoff and protect the river and its marine life. These goals will be implemented by seeding the river with 500,000 water-filtering oysters, promoting a greater public awareness of the river's problems, increasing the availability of programs and resources for homeowners on runoff issues, fostering partnerships that apply public and private resources to reduce pollution in the river and by investing local, state, and federal government in the effort to restore the Lynnhaven River.

### **5.11.3.4 Oceana Naval Air Station**

Oceana Naval Air Station is a large Naval Base located in the City of Virginia Beach. It is located in both the Lynnhaven Watershed and the Southern Watersheds. They have signed the Chesapeake Bay 2000 Agreement in hopes to be part of a bigger picture and have taken a compliance stance. Oceana has developed a stormwater management plan required as part of their permit from DEQ. A large part of this plan discusses the BMP's located within the Base. The BMP's are both structural and non-structural and include water separators, booms, storage sediment ponds, vegetative filters, spill control valves, and many more. Six of the thirteen stormwater discharge outfalls are within the Lynnhaven Watershed. Booms are located at several of these outfalls in order to collect oil and other runoff before entering into our waterways. There is a regional spill plan for illicit discharges (*get copy*) that include several BMP's such as separators and booms. Training is provided on base for the maintenance of the BMP's and housekeeping measures are always taking place. Oceana's stormwater permit also requires them to produce some form of environmental education that is available on base. Brochures are their most frequent way to spread environmentally sound information, these deal with a wide range of topics from the proper way to fertilize lawns to environmentally friendly car washing (Din, Wilkie).

Draft

Draft

Oceana's natural resource management takes care of a multitude of tasks including the maintenance and protection of wetlands, agriculture, forestry, and wildlife along with other natural resource related projects. They have buffers located on all ditches and canals and are currently looking to increase the buffer width to 5 feet. Oceana has several fields for agriculture and they are currently being cultivated, these fields have a permit to apply a manure-based fertilizer called a bio-solid. The fields are rotated when land-applying the fertilizer so it is not concentrated year after year in the same area. From time to time there will be wetland loss with development on the base and they are required to mitigate elsewhere, but must stay within the same watershed. In the past Oceana had to drain the wetlands located around the runways, the main reason for this was to make the land unattractive to wildlife and birds not only for their safety but the safety of the pilots. These wetlands were reconstructed elsewhere on the base. There are also corridors located near the runways for deer usage and to keep them off of the runways and away from danger. They are currently trying to construct an electric fence as a means of keeping wildlife away from harm (Hostetter, Brian). One area of concern on Oceana lies with the stables and the processing of their runoff. Aerial photography and maps show that the majority of the horses are located within the southern watershed and only a small portion drains to the Lynnhaven. Oceana stables take every precaution to keep the waste from polluting our waterways. They have a very ambitious spreading routine, where the manure is shoveled straight into the spreader and is dragged on a weekly basis; each field gets the treatment monthly. There are currently 130 horses located on Oceana's 160 acres of pastureland.

#### **5.11.3.5 Virginia Beach Council of Civic Organizations**

Founded in 1963, the Virginia Beach Council of Civic Organizations includes 100 civic organizations that represent between 250 to 7500 residents each. They are involved in many community activities including programs that focus on environmental issues. The Virginia Beach CCO holds BMP management and coastal plain and floodplain briefings in order to educate its members on the Lynnhaven community. They actively recruit members to participate in the Clean the Bay Day and Earth Day programs, as well as encouraging participation in the Storm Drain Stenciling program sponsored by Virginia's Clean Community Commission. The CCO takes pride in their community and hopes to see their efforts aid in restoring the watershed. They see the importance of educating all citizens who impact the watershed, as well as actively educating boaters and property owners as to the impact of stewardship on restoring the Lynnhaven Watershed and aquatic life.

### **6. Watershed Management Issues**

#### **6.1 Oysters**

Oysters play an important role in the history of the Lynnhaven. When early settlers arrived in the area, oyster reefs towered up from the river bottom, some breaking the surface at low tide.

Draft



Draft

Kings and Queens in England dined on plate-sized oysters from the Lynnhaven River. In the 1800's, all of the oysters in the Bay circulated the entire volume of Bay water through their bodies in just a few days. Now, though, due to over harvesting, disease, and decreasing water quality conditions, the once world-famous Lynnhaven Oyster is at 1% of historical levels.

Oysters are the natural cleaners of the water. Oysters filter sediment and nutrients, either consuming them or turning them into harmless packets that sink to the river bottom. A single adult oyster can filter 50-60 gallons of water a day. While oysters improve water quality, a certain threshold of high water quality must be reached in order for oysters to grow and thrive. Therefore, improvement in water quality will bring about an increase in oyster reefs, which will in turn, bring about a more rapid improvement in water quality.

## **6.2 Submerged Aquatic Vegetation (SAV)**

Submerged Aquatic Vegetation, or SAV, is a general term used to describe a number of species of grasses that grow entirely underwater. These grasses are found in shallow waters where sunlight can reach them. Correlations have been established between high water quality and SAV abundance. (VIMS) SAV and water quality have an interdependent relationship. A certain level of water quality is required for SAV to be present, and the presence of SAV improves water quality. It provides food, habitat, and shelter to a variety of animals, one of which is oysters, which are filter feeders and also improve water quality. SAV also releases oxygen into the water, needed by fish and other aquatic organisms, it filters and traps sediments, improving water clarity, and it reduces wave action and thus erosion along shorelines. When erosion is reduced, less sediment, trash, fertilizers, and pesticides enter the waterways. Additionally, less money is spent restoring shorelines or maintaining artificial shoreline protective devices like bulkheads and rip-rap.

Total amounts of SAV in the Chesapeake Bay were once thought to be approximately 200,000 acres, but by 1984 the area of SAV was only 38,000 acres. Aerial surveys done of the Lynnhaven River from 1984 to 2001 show a continued decline in SAV amounts. What are the reasons for SAV loss? SAV is subject to a variety of factors that can affect its ability to grow and spread. One large impediment is the increased amount of runoff from terrestrial habitats due to increased impervious cover, development of the land, and loss of wetlands and riparian buffers that filter sediment that runs into the water. The increased suspension of sediments clouds the water and prevents adequate sunlight from reaching the SAV. Another problem is the increased use of fertilizers, pesticides, and herbicides. While fertilizers containing nitrogen and phosphorous help SAV to grow, excess amounts can cause algae blooms, which block sunlight from reaching the vegetation. Pesticides and herbicides, of course, can kill off SAV. The lack of oysters to filter and clean the water has also contributed to poor conditions for SAV.  
(Chesapeake Bay Program Office)

## **6.3 Crabs**

Draft

Draft

The Lynnhaven plays a significant role in the migration of the blue crab. The crabs seek refuge in our warmer waters during the cold winter season. If the rapid deterioration of water quality continues, the crabs will have no place to migrate to during the winter.

#### **6.4 Riparian Buffers**

Riparian buffers are areas of trees, shrubs, and other vegetation adjacent to waterways. These areas of vegetation benefit water quality in a variety of ways. As water runs off from upland areas and makes its way to waterways, roots and leaf litter filter sediment carried by the water, absorb fertilizers, waste from livestock and domestic animals, and reduce the amount of pesticides reaching the water. Roots from the vegetation hold soil in place, reducing erosion, which improves water clarity; the riparian buffer is also less expensive than bulkheads or riprap as a shoreline stabilization method. The shade provided by riparian buffers helps to moderate shallow water temperatures, providing for a stable habitat for certain types of fish. The trees also serve as shelter and homes for terrestrial and aquatic birds. Fallen leaves serve as food sources for a number of small bottom-dwelling animals that are a crucial part of the food chain.

In the City of Virginia Beach, many property owners adjacent to the Lynnhaven River and its tributaries have beautifully manicured lawns running straight down to a bulkheaded shoreline. When water runs down these slopes, it takes with it fertilizers, grass seed, herbicides and pesticides that are needed to maintain these lawns in their pristine condition. Since these properties are the last line of defense in controlling non-point source pollution, they must play an active role in using riparian buffers to control runoff from their land that is detrimental to water quality. Property owners should be encouraged to plant vegetative buffers along the edge of their lawns. Since many people will be concerned about losing their view, an extensive plant list of ground covers and shrubs should be developed to allow homeowners to plant a riparian buffer without sacrificing their view.

The City of Virginia Beach should take the lead in being an example to homeowners by planting riparian buffers on its waterfront property. Parks, golf courses, recreation centers and other municipal properties should all have riparian buffers along their waterways.

#### **6.5 Navigation**

Every day thousands of vessels move people, animals, and products around the country and the world by water. This water traffic is a vital component of the nation's economy and it is the Army Corps of Engineers job to make sure this traffic moves safely, reliably and efficiently and with minimal impact on the environment. The Corps primary navigation responsibilities include planning and constructing new navigation channels, locks and dam, and dredging to maintain channel depths at U.S. harbors and on inland waterways. The Corps carefully evaluates the environmental impact of each navigation project it undertakes. They perform computer modeling of planned changes to river and estuary systems to fully assess and limit the environmental effects of navigation projects prior to beginning any work. They also protect the environment by using their dredge material as a resource for habitat and wetland

Draft

Draft

creation, by timing their dredging activities as not to disrupt or damage any marine species as well as using high tech instruments to monitor dredging locations and activity to limit environmental harm. However, if there is a channel that continuously needs to be dredged, there may be better ways to keep the channel clear. Continuously stirring up the silt on the floor of the waterway will cause cloudy water from suspended solids and this in turn will result in depleting sunlight to SAV and destroy habitats for marine wildlife. Other options to keep channels clear of sand could involve strategically placing oyster reefs to deter erosion from the shoreline.

Millions of dollars worth of goods are imported and exported through the port of Norfolk and it is a large part of this community's economy. It is evident that with such a large amount of navigation in area channels, they must keep it as environmentally sound as possible.

## **6.6 Sediment Loading**

In the event of a storm, in a natural landscape, vegetation helps to absorb and slow down the velocity of excess stormwater runoff. Impermeable surfaces such as roadways and parking lots are associated with urbanized areas. These surfaces yield elevated runoff velocities and don't filter out excess sediment and nutrients. Sites of development or construction are culprits when it comes to excess sediment inundating our waterways. Silt fences are put up in order to prevent this, however if the fences are not maintained they do not serve their purpose. When sediment-laden runoff enters our streams at a high velocity, it causes erosion problems, overloading the stream with sediment. Erosion also undercuts banks and further increases the stream's sediment content.

An excess of sediment causes a widening and filling in of the stream bed. Excess silt can also clog the respiratory organs of young fish. Fine sediment can trap young fish, deplete oxygen levels and smother eggs, as well as marine life residing under rocks on the streambed. Removing even one organism from the balanced food chain can impact the entire ecosystem.

Silt laden waters absorb heat more readily; resulting in elevated water temperatures and in turn, depleted dissolved oxygen concentrations. Sediment particles cloud the water and decrease the amount of light penetrating through the water. These sediment particles also carry nutrients, particularly phosphorous, causing algae to grow. This only clouds the water, more preventing more sunlight from reaching the aquatic plants on the streambed.

## **6.7 Nutrient Loading**

Eutrophication is a process whereby water bodies, such as lakes, estuaries, or slow moving streams receive excess nutrients that stimulate excessive plant growth, most commonly algae. This is a natural process that occurs to all lakes over time as rocks and soil weather, and lead to an accumulation of nutrients in the water. This is a process that takes hundreds of years, but when human activities are involved it takes a matter of a few decades and is called artificial eutrophication. Agricultural runoff, urban runoff, leaking septic systems, sewage discharges,

Draft

Draft

eroded stream banks and similar sources all increase the flow of nutrients into our aquatic systems. These activities cause excessive nutrients that over stimulate the growth of algae creating conditions that interfere with the recreational use of lakes, and the health and diversity of indigenous fish, plant and animal populations. These excessive algal growths are called algal blooms and they hurt the system in two ways. First, they cloud the water and block sunlight, causing underwater grasses to die. Because these grasses provide food and shelter for aquatic creatures, spawning and nursery habitat is destroyed. Second, after large concentrations of algae have built up, aerobic processes such as respiration and the decomposition of algal cells become increasingly significant. This results in a reduction of the level of dissolved oxygen. Eventually, often near the bottom of a lake, virtually no oxygen remains and the water is said to be anoxic. Under these conditions anaerobic bacteria flourish, not only killing the lake but producing foul-smelling compounds and resulting in extremely unpleasant water.

The reduction of artificial eutrophication can be achieved through conscientious efforts. Reducing the use of nitrate-containing fertilizers, aerating lakes and reservoirs to prevent oxygen depletion, and removing phosphate-rich sediment and plant material from affected waters can all help to sustain healthy lakes within the community.

## 6.8 Wetlands

Wetlands are areas of land where shallow water covers the soil all year or for various periods of time, depending on weather conditions. The amount of saturation influences the types of plants that develop in the wetlands. Both terrestrial and aquatic life forms can be found in wetlands. Wetlands are important because they filter runoff from the land, help to control flooding, and provide valuable habitat for many animals. Unfortunately, wetlands were once thought to be ecosystems without any value, only breeding grounds for mosquitoes and snakes. As a result, through much of the 20th century, wetlands were drained or filled in for agriculture or development. Wetlands levels in the Chesapeake Bay Watershed plummeted. Even now, as their value has been realized, wetlands are still in danger from excessive sedimentation from the terrestrial environment, increased wave action from watercraft, and inadequate laws to protect wetlands from development.

In the Lynnhaven Watershed, there are approximately 5700 acres of wetlands. Most are tidal wetlands, areas of fluctuating water levels and a saline environment which makes it difficult for some plants to take hold, and these wetlands are just mud flats. Some hardy plants, though, are well-adapted to this environment such as saltmeadow cordgrass (*Spartina alterniflora*), saltgrass (*Distichlis spicata*) and black needlerush (*Juncus roemerianus*). In the more brackish upper reaches of the Lynnhaven, big cordgrass (*Spartina cynosuroides*) and switchgrass (*Panicum virgatum*) are commonly seen. Inland forested wetlands are dominated by the Bald Cypress, Red Maples, and Black Gum trees.

## 7. Recommended Watershed Management Strategies, Incentives to Address Issues, Goals, and Policies

Draft

## 7.1 Oyster Strategy/Goals and Objectives

Oysters are an identifying component in the Lynnhaven Watershed. Their importance lies in sustenance for the economy, the quality of our water as well as the history and cultural of our community. The Lynnhaven Watershed Management Plan focuses a large portion of its efforts in their growth and ability to thrive to bring Lynnhaven back to its' origin.

**Goal:** Increase oyster brood for water quality purposes and to allow oyster industry to return to the Lynnhaven Watershed.

**Objective:** Establish oyster hatchery to increase seed oysters efficiently in large quantities.

**Action:** Oyster grow out facility at Crab Creek; locate adjoining Lynnhaven Boat Ramp.

**Action:** Explore other sites for Oyster grow out facilities and establish two over the next four years.

Work with Chesapeake Bay Foundation, VMRC, Corps and VIMS to develop oyster grow out facility for seed oysters to repopulate oyster reefs in Lynnhaven; funding through Oyster Heritage Trust Fund; create new technical staff positions to maintain facility

**Objective:** Increase citizen interest and involvement with oysters.

**Action:** Encourage and provide resources for citizens to grow oysters.

**Action:** Encourage school system to get children involved through demonstrations and oyster projects.

**Action:** Have local restaurants and oyster bars recycle their oyster shells as a resource for both growing new oysters and for use in shoreline stabilization projects.

Work with Lynnhaven 2007 to create educational material and demonstrations for the community and school systems; Target school system on addressing oysters and their effect on the watershed in curriculum; Locate restaurants interested in donating oyster shells and their involvement can increase public interest and involvement; Funding through Lynnhaven 2007 as well as Oyster Heritage Trust Fund;

**Objective:** Establish oyster reefs within Lynnhaven Watershed.

**Action:** Work with Bay Island Yacht Club to restore oyster reefs along shoreline.

**Action:** Work with First Landing State Park to create shoreline oyster reef at Long Creek off of Linkhorn Bay to control shoreline erosion.

**Action:** Continue to identify more sites for possible oyster reef establishment.

**Action:** Publicize the environmental efforts being made towards the Lynnhaven and with oysters on the city's website along with displaying information at local libraries.

Work with Chesapeake Bay Foundation, VMRC, VIMS and Army Corps in the placement and creation of new oyster reefs in the Lynnhaven Watershed; funding by Oyster Heritage Trust Fund and possibly by EPA; Can use oysters from the grow out facilities as well as oyster shells from dredged material; Funding could possibly come in the form of Commonwealth supplying shells, this would reduce City cost and allow us to include Commonwealth as in-kind partner as well as allowing for more construction of oyster and shore line protection projects.

**Objective:** Increase areas open to commercial oyster harvesting

**Action:** Focus on Broad Bay, where some areas periodically open for commercial oyster harvesting now. Work to make those openings year-round and increase the size of the area through the building of additional reefs, increasing the size of existing reefs, and adding more oyster shell to shorelines.

**Objective:** Increase flow at Lynnhaven Inlet for maximum oyster growth and spawning

**Action:** Widen the mouth of the Lesner Bridge with the Bridge Replacement Project

The Bridge Replacement Project will be a long-term goal, possibly 15-20 years from now with the Army Corp of Engineers. In 1928 a highway bridge was built over the Lynnhaven Inlet, employing extensive fill for the approaches. The inlet was narrowed from 1900 feet to 900 feet where 710 linear feet of fill was added on the east side of the inlet and 250 on the west side. Citizen project advocates spoke out at a hearing in 1945, considering the effect of inlet construction on tidal flow, and stated that since the construction of the bridge navigation was greatly restricted and the flow of tides was greatly reduced through the inlet to and from the connecting waters. It was also noted that the narrow inlet did harm the oysters. In 1958 200 feet of additional tidal opening was constructed on the east side of the inlet to help the flushing according to a ACE document, however stronger measures need to be considered in order to get the maximum flushing back to the Lynnhaven inlet and to the oyster broods.

## **Oyster Heritage Program Strategy**

Draft

The strategy for the future of the Oyster Heritage Program is to maximize the restoration efforts with the available funds. As environmental programs are cut from tight federal budgets, money for programs such as this will disappear. Additionally, Virginia is ranked 50th in the nation in environmental spending. Efforts should be made to rally citizens to lobby their legislators on both the state and national level to preserve funding for the VOHP. Additional efforts need to be made to raise awareness of the VOHP through a web page on the City's web site and informational materials in City libraries, inserts in water bills, and public service announcements on television and radio. Desirable sites for oyster reefs need to be identified and leases secured from lease owners, if necessary, so that when funding becomes available, construction on reefs can occur without delay. Efforts on this are already underway through Lynnhaven River 2007 and the ACE. An oyster shell-recycling program in conjunction with area restaurants should be instituted to use on area reefs. This program will need to be coordinated with the Public Works Department to pick up the shells on a weekly basis and deposit them at a suitable location until they are needed. An oyster grow-out facility should be established in the watershed. Suitable areas should be identified and the best-suited and most feasible area selected. Oysters can then be grown until they are big enough to not be threatened by predators, and then transferred to the reefs in the Lynnhaven.

## **7.2 Stormwater Management and Non-point source Pollution Strategy**

### **Goals and Objectives**

**Goal:** Reduce non-point source pollution and runoff in the Lynnhaven Watershed.

**Objective:** Citizen awareness and education.

**Action:** Educate citizens on proper lawn care techniques, particularly on, time to fertilize, amount of fertilization needed and environmentally friendly products.

**Action:** Target lawn care companies and nurseries as well as hardware stores to promote environmentally friendly fertilizers and to display proper application techniques for their customers.

**Action:** Educate citizens on the effects of pet waste in the Lynnhaven Watershed.

**Action:** Educate citizens about car maintenance and its contribution as a non-point source pollutant in our waterways.

**Action:** Target local service stations to promote car maintenance not only for the vehicle but also for its effects on the environment. Possibly have something to hand out with every state inspection discussing these issues.

**Action:** Address Virginia Marine and Science Museum about getting a permanent exhibit for Lynnhaven Watershed.

Draft



Draft

Work with Public Works, HRPDC, Lynnhaven 2007 and Virginia Marine Science Museum to produce educational material to expose community to, as well as locating interested businesses to display material; see if school system would be interested in using these topics in curriculum; possible funding by Lynnhaven 2007.

**Objective:** Seek state-wide legislative changes

**Action:** Piggy-back onto existing legislation requiring applicators of pesticides and herbicides to be licensed; require applicators of fertilizers to be licensed as well.

**Objective:** Aerate ponds and impoundments with high levels of nutrients due to stormwater runoff

**Action:** Locate eutrophic water bodies in Lynnhaven Watershed and install aerators.

Aeration of these waters will improve biotic activity in the waters to reduce nutrients going over board to the receiving streams and rivers; aeration should result in a positive change of microorganisms to those which consume bacteria such as protozoa's, and rotifers; aeration will reduce oxygen demand and should increase the dissolved oxygen levels in the discharge waters to reduce oxygen demand and supply oxygen to the receiving waters; depending upon the type of aeration, microbial reduction due to increased exposure of bacteria laden waters. The impounded waters should also experience a reduction in trophic state and reduction of organic sludge buildup, possibly negating some or all dredging needs.

**Objective:** Increase Street sweeping in the Watershed.

**Action:** Locate streets swept and expand area so that miles swept doubles over the next two years.

**Action:** Obtain at least two more street sweepers over the next two years.

Work with Public Works on the feasibility and effectiveness of this project in comparison with other non-point source pollution related projects.

**Objective:** Increase number of vegetated BMP's in Lynnhaven Watershed.

**Action:** Locate possible and probable new locations for vegetated BMP's.

**Action:** Hold a vegetated BMP demonstration on public or City property.

**Action:** Find citizens willing to volunteer their property for vegetated BMP demonstrations.

Draft

**Action:** Require a certain percentage of new development or redevelopment to have LID incorporated into its design, if necessary use a tax or financial incentive.

**Action:** Readdress parking lot specification to include LID or vegetated BMP's

**Action:** Have DSC encourage LID when permitting, discourage impervious cover and more diconnectivity.

**Action:** Encourage innovative BMPs such as bioretention areas, rain barrels, and green roofs.

Work with Public Works to design and implement BMP's and work with Lynnhaven 2007 along with other advocacy groups to drum up participation and volunteers; Funding by either Public Works or Lynnhaven 2007.

**Objective:** Construct structural BMP's that will handle non-point source runoff in highly populated areas

**Action:** Develop new regional BMP to capture untreated runoff from Pembroke Mall and Pembroke Office Park areas

**Action:** Retrofit storm drain outfalls from Virginia Beach Boulevard, which directs discharge to Thalia Creek with BMP's

**Action:** Ensure BMP's for retrofit of existing and new development are incorporated into long-range plans at 31<sup>st</sup> Street and Convention Center, these areas discharge to headwaters of Linkhorn Bay

**Action:** Public works to install vortecnic units in Great Neck Area, Reserve and Lynnhaven Cove

**Action:** Continue researching new areas in need of BMP's within the Lynnhaven Watershed

### **7.3 Riparian Buffer Strategy/Goals and Objectives**

There are 212 miles of shoreline in the Lynnhaven River, Broad Bay, Linkhorn Bay, and the associated tributaries.

**Goal:** Restore 20 miles of riparian buffers in the Lynnhaven Watershed.

**Objective:** The City of Virginia Beach takes the lead by restoring riparian buffers on

Draft

City property.

**Action:** Restore 10 miles of riparian buffer on City property.

**Objective:** Encourage businesses and homeowners to restore riparian buffers on their properties.

**Action:** See 10 miles of riparian buffers restored on private property.

**Action:** Create tax incentives to encourage buffer restoration on private property.

**Action:** Educate landowners on the benefits of riparian buffers

**Action:** Establish riparian buffer plantings along channel at Bow Creek Golf Course and install debris racks to prevent debris flowing into golf course

**Action:** Reestablish riparian buffer zone along headwaters of Mill Dam Creek on public properties

**Action:** Work with schools for possible buffer projects

#### 7.4 SAV Strategy

Ideally, this plan would include a strategy for restoring a certain number of acres of SAV in the Lynnhaven. SAV is fragile, though, and difficult to establish without a certain level of water quality. Restoration efforts in the past have not been very successful. The best strategy for SAV at this time is to improve water quality, particular water clarity to the point that restorations will have a higher chance of success. The establishment of successful oyster reefs is often a predecessor to SAV restoration; the improvement in water clarity brought about by oysters is often followed by a natural re-occurrence of SAV. Thus, the strategy for increasing SAV is to improve water clarity through other measures.

#### 7.5 Sanitary Sewer Strategy/Goals and Objectives

**Goal:** Reduce the threat of human fecal contamination in area waterways by updating or eliminating outdated sanitary sewer systems in the Lynnhaven Watershed.

**Objective:** Continue conversion of homes with septic tanks to City Water and Sewer.

**Action:** Reduce number of active septic tanks in the watershed to less than 100 by the year 2010.

**Objective:** Reduce the threat of cross-contamination to storm drains and groundwater from clay sanitary sewer drain lines coming from homes.

**Action:** Provide grants or low-cost loans to interested citizens to upgrade old clay sewer lines with the insertion of new polyethylene and resin liners.

**Action:** Determine probably location of clay sewer lines, based on the year

Draft

Draft

houses were constructed and other methods.

**Objective:** Ensure that pump stations are operable 24 hours a day, 7 days a week, no matter what the weather conditions.

**Action:** Provide back-up generators for all pump stations

**Action:** Organize a systematic method of checking pump stations' operability during extreme weather events.

**Action:** Analyze spill reports for patterns such as routine main line blockages and provide proposed remedies such as more sewer cleaning trucks and personnel accordingly

**Objective:** Randomly test storm drain systems for illegal sanitary sewer hook-ups.

**Action:** Continue current policy of random tests using the optical brightener test.

## **7.6 Public Education, Stewardship, and Awareness Strategy/Goals and Objectives**

**Goal:** Increase the public's awareness of the importance of the Lynnhaven River Watershed and what they can do to improve it's quality.

**Objective:** Increase schools' participation in the watershed management process

**Action:** Tie in Lynnhaven River education to the science Standards of Learning (SOLs).

**Action:** Develop a curriculum about local ecology for area students.

**Objective:** Increase awareness of the boundaries of the Lynnhaven Watershed and help everyone to know their "watershed address."

**Action:** Place signs on roadways stating when motorists are entering the Lynnhaven River Watershed.

**Action:** Place signs on bridges over waterways stating the name of the waterway and that it is a part of the Lynnhaven Watershed.

**Action:** Put "I Live in the Lynnhaven Watershed" bumper stickers and magnets in watershed residents' water bills.

**Objective:** Get residents' attention in new, innovative ways

Draft

Draft

**Action:** Create a character, “Stormwater Man” to appear on television in Public Service Announcements and educate citizens about the importance of the Lynnhaven River Watershed.

## **7.7 VB Comprehensive Plan/Goals and Objectives**

### **7.8 Water Use Conflict Strategy/Goals and Objectives**

Draft an MOA for the Lynnhaven River to promote safe recreational activities through increased public awareness of use conflicts, and to protect the natural environment from damage from on-water uses through public education.

Similar successful agreements have been drafted for the North Landing River and Back Bay in Virginia Beach.

A No Discharge Zone is to be established for the entire Lynnhaven Watershed to protect our waterways from boats waste. This will be the first one of its kind in such an urban area and in an estuarine body. The No discharge zone will require all watercraft to dispose of their waste in posted pumpouts stations. Currently any marina holding more then 50 slips is required to have a pumpout station, however if the No Discharge Zone is established, more stations will be required as well as more personnel for enforcement purposes.

### **7.9 Dredging, Disposal and Shoreline Stabilization Strategy/Goals and Objectives**

**Goal:** Shoreline stabilization throughout Lynnhaven Watershed

**Objective:** When dredging for navigational purposes, use dredged material of both sediment and recovered oyster shells for shoreline stabilization.

**Action:** Focus on Narrows Boat Ramp for channel dredging and stabilize shoreline with a shoreline oyster reef to reduce frequency of dredging.

**Action:** Create way to sift through dredged material from Lynnhaven inlet and nearby residential areas for useful stabilization material such as oyster shells.

**Action:** Talk to landscape services about stabilizing any hotspots throughout the community were there is bare land and grass could be planted.

**Objective:** Create an inventory of problem areas

**Action:** Identify all severely eroding shorelines in the watershed.

**Action:** Formulate a plan to mitigate and maintain severely eroding shorelines.

Draft

**Action:** Encourage natural channel design.

**Objective:** Make the City a lead in repairing eroding shorelines

**Action:** Conduct a demonstration project on City property and publicize the work that is done so that the public can come view it.

**Objective:** Formulate right of entry strategies

**Action:**

Tax incentives for citizens and business who repair severely eroding shorelines on their properties in ways other than adding a bulkhead or rip-rap, such as planting buffers, wetlands, and oyster reefs as water breaks.

Rethink Corp maintenance project at Narrows to incorporate beneficial use of dredged material (wetlands restoration, erosion control), thereby reducing frequency of need to dredge in future as well; Work with Army Corps to use Federal CAP funds for projects such as beneficial use of dredged material where City can match cost to reduce City's overall cost, also work with VMRC on these projects; Possible to contract directly with DCR for design of stabilization projects.; We need not only focus on shoreline erosion but land within the Watershed; get landscape services involved to service any bare sandy spots throughout the Watershed to keep sediment out of the storm drains.

## 7.10 Water Quality/Monitoring Strategy

**Goal:** A comprehensive monitoring and tracking system for different agents in the Lynnhaven Watershed to improve overall water quality.

**Objective:** Improve water quality in the Lynnhaven River

**Action:** De-list impaired waterways from the State Impaired Waters list

**Objective:** To keep a running track of the different sources in our waterways and monitor their progress as other water quality-enhancing projects are installed.

**Action:** Biological source tracking to track sources of human sewage into the City's storm drain and receiving waters.

**Action:** Identify high sources of fecal coliform bacteria loadings at Mill Dam Creek and perform a Dey Cove source ID study.

Draft

**Action:** Purchase and install high tech tide gauges for continuous water quality monitoring stations throughout the Lynnhaven Watershed.

**Action:** Use members and volunteers from Lynnhaven 2007 to monitor water quality throughout the Watershed in order to get more data over a larger area to track progress over the next 3 years.

**Action:** Monitor BMPs to check their effectiveness

### 7.11 Wetlands Strategy

**Goal:** Restore 50 acres of wetlands over the next 10 years

**Objective:** Determine best-suited locations for wetlands restoration

**Action:** Perform wetlands restoration at the following locations:

Princess Anne High School  
Thalia Creek  
Lake Windsor  
Bow Creek Golf Course

**Objective:** Serve as a lead to the private landowners in wetlands restoration

**Action:** Perform 25 acres of wetlands restoration on City property

**Action:** Offer tax incentives to private landowners to perform wetlands restorations

### 7.12 Open Space Strategy

**Goal:** Lessen development of environmentally sensitive land in Lynnhaven Watershed.

**Objective:** Acquire open space.

**Action:** Specifications and requirements for obtaining open space status need to be more accurate and easily understood.

**Action:** Purchase and restore Pleasure House Point

**Action:** Purchase Washington Square property

**Action:** Identify other areas to be purchased for open space

**Action:** Identify funding sources to purchase properties with.

Draft



Draft

At appropriate time purchase both Pleasure House Point Property and Washington Square Property to restore with wetlands and natural buffers for enhancing water quality in Lynnhaven Inlet and Lynnhaven Bay area (Broad Bay water quality is best due to presence of First Landing State Park along shoreline); State funding assistance currently available to augment open space funds; Possibly start up a fund like the Oyster Heritage Fund that citizens are required to pay into due to permitting issues; West End Bay Island is another possible purchase to pursue for open space.

8. Recommended Changes to Laws, Regulations, and Ordinances
---

P-1 Zoning Revisions

Mandated Changes to CBPA Ordinance

Mandated Changes to Stormwater Management Ordinance

Current Federal and State Laws and Regulations

9. Watershed Management Actions and Guidelines
--

Milestones

Target Dates

Corps Environmental Restoration Study

Corps Oyster Restoration Project

10. Phasing and Implementation Plan
-------------------------------------

### 10.1 Funding

1. Increase stormwater fees
2. Increase statewide stormwater fees (for permits)
3. Investigate other sources from state and feds such as WQIF, Chesapeake Bay grant, Chesapeake Bay license plate money, EPA, ACOE, and USDA.
4. Solicit donations in private sector
5. Make better use of local government funds such as HEC money.

CIP

Ordinance Revisions

11. Evaluation of Watershed Management Plan Effectiveness
---

12. References
----------------

13. Appendices
----------------

13.1 List of Abbreviations

13.2 List of Acronyms

Draft

## Acronym List

ACB	Alliance for the Chesapeake Bay
ACE	Army Corps of Engineers
AICUZ	Air Installations Compatible Use Zone
BMP	Best Management Practices
CIP	Capital Improvement Plan
CBF	Chesapeake Bay Foundation
CBPA	Chesapeake Bay Preservation Area
CBPAO	Chesapeake Bay Preservation Area Ordinance
CBLAD	Chesapeake Bay Local Assistance Department
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
DSC	Development Services Center
ERU	Equivalent Residential Unit
E&S	Erosion and Sediment
EPA	Environmental Protection Agency
HRPDC	Hampton Roads Planning District Commission
HRSD	Hampton Roads Sanitation District
LID	Low Impact Development
MOA	Memorandum of Agreement
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NPS	Non-point source
OSHA	Occupational Safety and Health Administration
PWC	Personal Watercraft
RPA	Resource Protection Area
SAV	Submerged Aquatic Vegetation
TMDL	Total Maximum Daily Load
VBCCC	Virginia Beach Clean Community Commission
VBCCO	Virginia Beach Council of Civic Organizations
VMRC	Virginia Marine Resources Commission
VOHP	Virginia Oyster Heritage Program

### 13.3 Glossary of Terms

### 13.4 List of Tables

### 13.5 List of Figures

### 13.6 List of Maps

Watershed Location in City  
Major Subwatersheds  
Waterway Names and Locations  
Existing SAV Areas

Draft

## Existing Sanctuary Reefs

Draft